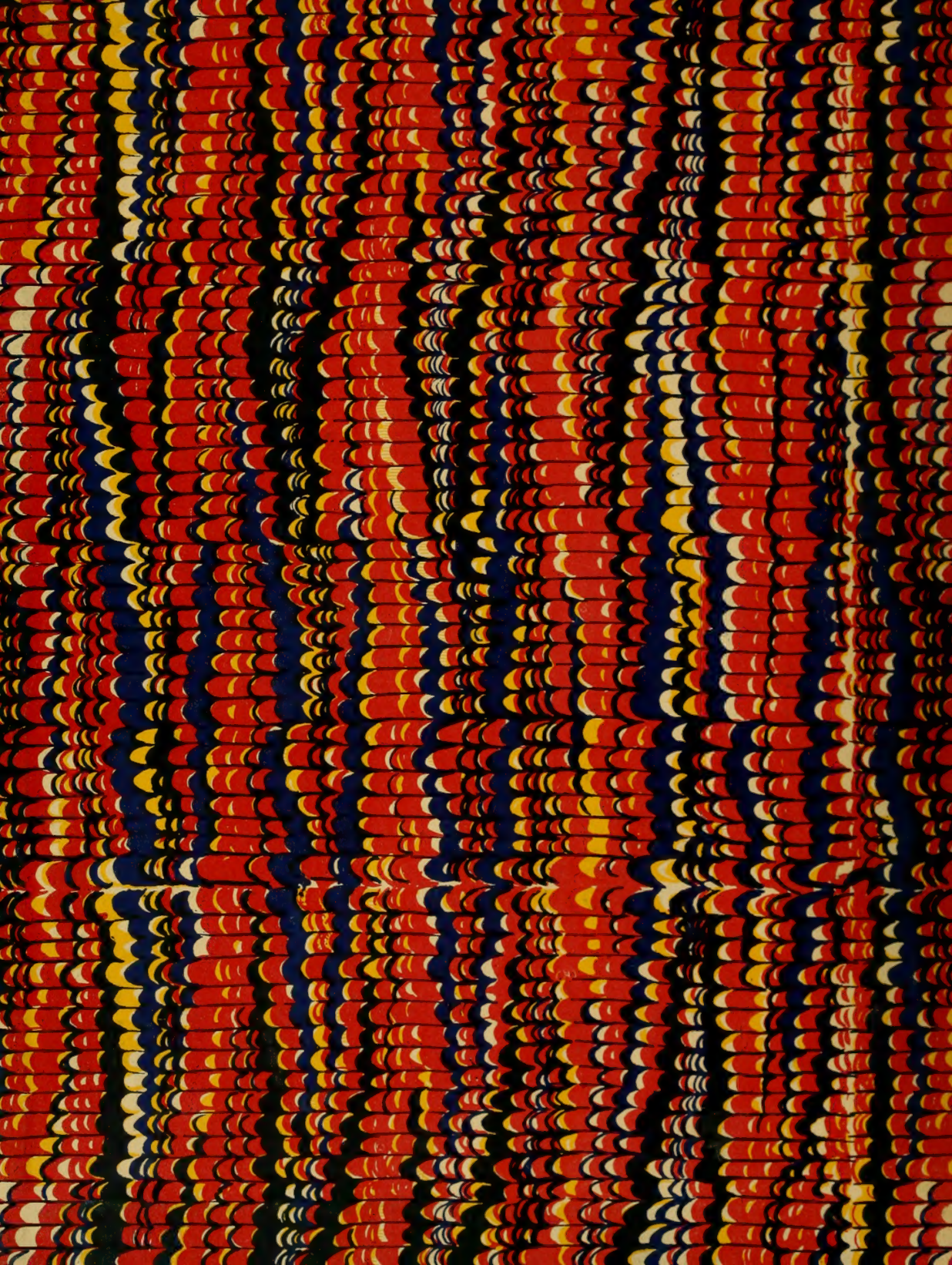






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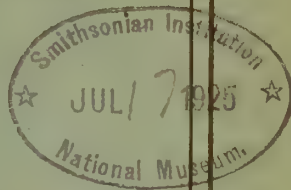
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Royal Zoological Society of New South Wales.

NOTES.

Mr. Allan R. McCulloch, a member of the Council of the Society, has obtained leave of absence for six months, and left on a visit to Lord Howe Island. We trust the trip will restore Mr. McCulloch to perfect health.

Dr. A. B. Walkom, Secretary of the Linnean Society, has resigned his position on the Council of the Royal Zoological Society, and the vacancy has been filled by the appointment of Mr. James Roy Kinghorn, of the Australian Museum staff.

The annual meeting of the Royal Zoological Society will take place in the theatre attached to the Zoology Department of the Sydney University at 8 p.m. on Wednesday, 15th July. The annual dinner of members and their friends will precede the meeting, and take place in the Union Hall at the University. Members are requested to notify the Hon. Secretary of the number of seats they desire engaged.

After the meeting Mr. E. F. Pollock will deliver a short lecture entitled "Camera Studies of some Australian Birds," which will be illustrated by a fine collection of lantern slides from studies made by camera naturalists largely resident in other States.

The following new members of the Society have been elected since the last issue of the "Zoologist":—Ordinary members—J. A. Miller, Dr. A. Duncomb. Associate members—G. P. Whitley, W. J. Thorpe and Dr. Martian Stanko (Mexico).

The following six members of the Council will retire, in terms of the Articles of Association, at the annual meeting, and are eligible for re-election:—Dr. G. A. Waterhouse, Prof. Launelot Harrison, and Messrs. A. J. Nicholson, J. R. Kinghorn, A. Halloran and H. E. Finckh.

On Thursday evening, 25th June, at the Australian Museum, Mr. E. F. Pollock, the Hon. Secretary of this Society, will deliver a lantern lecture entitled, "Beasts and Birds through a Camera," in which, we understand, he will make a special appeal for the encouragement of Nature study by young people.

Congratulations to Dr. R. J. Tillyard on his election as a Fellow of the Royal Society, London; to Mr. Charles Hedley, who has been awarded the Clark Memorial Medal for his meritorious research work; to Mr. R. H. Cambage, who has received the honor of Commander of the Order of the British Empire; and to Mr. Tom Iredale, who has been appointed Conchologist to the Australian Museum.

The Monograph of the Australian Loricates will be continued in next Part of this Journal.

Members are reminded that their annual subscriptions become due on the 1st July. Ordinary members, £1/1/; Associate members, 7/6.

SHEARWATERS ON LION ISLAND.

Plate i.

On 1st December, 1924, a party consisting of members of the Ornithological Section of the Society paid a visit to Lion Island, in the Hawkesbury River Estuary, otherwise called Broken Bay, about twenty miles north of Sydney Heads. This island strikingly resembles a lion *couchant* in its outline, as viewed from Pittwater, its bold sandstone headland facing the entrance to the Bay, while the land falls rapidly westward forming the shoulders, and is rounded off by a gently sloping point which represents the hindquarters of the lion.

At the invitation of Mr. Harry Wolstenholme the party spent Saturday night at his seaside residence fronting the ocean at Palm Beach, and by daylight on Sunday they were on board a launch which conveyed them over the two miles of the Bay to the Island, where they landed in a sandy cove. The morning was crisp and clear, and a short climb over sandstone boulders fallen from the cliffs brought the members to the first burrows of *Puffinus pacificus*, the Wedge-tailed Shearwater. There was little soil amongst the boulders, but a foot or so supported the tangled growth of scrub and trees clinging to the sides of the cliff. Amongst the rocks and under the roots of the scrub the Shearwaters had made their nests and laid their single white eggs. This bird is as punctual in its breeding habits as its cousin of Bass Strait and Cape Woolamai, Victoria, *Puffinus tenuirostris*, the Short-tailed Shearwater, the first eggs being laid with commendable regularity on the 26th of November each year, while by the first of December there is not a tenanted burrow without its egg.

While rather longer from tip to tip than the southern species, *P. pacificus* is of slighter build, and lays an egg very little more than half the bulk and weight of that of *P. tenuirostris*, and the young bird is never so fat or toothsome (!) as the Tasmanian "Mutton Bird." The Wedge-tail has a range in Australia extending from Montague Island, N.S.W., to Raine Islet, Northern Queensland, and from South-west Australia to probably the same northern latitude. It is evidently extending its range southward, while the Short-tail is doing the same in a northerly direction; the two species are found together amongst the countless thousands of dead birds that are washed up on the shores of eastern Australia every year about the end of October. No completely satisfactory explanation of this remarkable mortality has ever been given, although several theories have been advanced from time to time.

The colony on Lion Island probably consists of a thousand or more birds, and they appear to be little disturbed by enemies, although doubtless some young birds and eggs are taken by the large lace lizards and hawks. They are not molested by man, so far as could be ascertained.

NOTE ON AN AUSTRALIAN SHRIMP OF THE GENUS *PENAEUS* AS A
COMMERCIAL FISHERIES PRODUCT IN WELLINGTON.

By W. J. PHILLIPPS, F.L.S., F.R.G.S.

Dominion Museum, Wellington, N.Z.

(Plate ii., fig. 1).

During the autumn months (March and April), enormous numbers of a crustacean were sold in most Wellington fish shops as Sydney prawn. These had been imported from Sydney markets and found a ready sale among all classes of the community. The manager of the N.Z. Trawling and Fish Supply Co. informed me that approximately one ton of Sydney prawns had been imported by him and sold during the above season.

Apparently there are two species of *Penaeus* abundant in the shallow waters of New South Wales, both of which are most popular articles of food in Australia. The first and probably the best known is *Penaeus esculentus*, which reaches a length of nine inches, while the second, *Penaeus macleayi*, is a little smaller. Specimens of the shrimp exposed for sale in Wellington agreed in most respects with *Penaeus macleayi* as described by Haswell (*Cat. Aust. Crustacea*, p. 201, 1882), and measured from four to five inches in length, having a most remarkable length of antennae, which in almost every case measured from six to nine inches.

An interesting point of difference between our examples and *Penaeus macleayi* may be noted. According to Haswell's description, the rostrum of *Penaeus macleayi* is unarmed below and has above five or six teeth of which the fifth is separated from the fourth by an interval greater than that separating the others. In our examples, as may be clearly seen from the photograph (Plate ii.), the fifth and sixth teeth are separated by a greater interval than any of the others. This character is constant in all specimens; and, if, on examination of Haswell's type, his description of *Penaeus macleayi* is found to be correct, there is a possibility that our examples are new to science. In this case, I suggest the name *Penaeus haswelli* for our species.

Penaeus esculentus agrees with our examples in that the superior border of the rostrum is armed with a series of six pointed teeth, of which the most posterior is separated from the next by a distance greater than the interval between the others. *Penaeus esculentus* has, however, three or four teeth on the lower border of the rostrum.

Dr. Alcock (*Cat. Ind. Decapod Crustacea in Ind. Mus.*, pt. 3, 1906), referring to the genus *Penaeus* points out that it is well represented in the Indian Ocean, and forms a large part of the food of many fishes. But beyond this the Crustacea of the genus *Penaeus* constitute no inconsiderable part of that plentiful harvest of the sea so prolific around the Indian coast line. It is difficult to say what the prawn fisheries of India may be worth; but Kishinouye in the *Journal of the Fisheries Bureau of Tokyo*, 1900, valued the dried prawns exported from Japan to China at a little over £20,000. Most edible crustacea sold as prawns or under parallel native names in India, California, Japan, and Australia are referable to the genus *Penaeus*.

PRACTICAL OBSERVATIONS OF ORNITHORHYNCHUS
BENEATH WATER.

(Plate ii., figs. 2 & 3.)

By HARRY BURRELL, C.M.Z.S.

In his original and instructive book, "The Minds and Manners of Wild Animals" (page 9), Dr. W. T. Hornaday states:—"In animals or men, instinct often functions as a sixth sense." On that particular point I agree entirely but desire to add here that the sixth sense referred to (call it Instinct if you will) appears to be general, and more constant in *Ornithorhynchus* than in other creatures that I have most critically observed, including "reasoning man."

From my first observations of *Ornithorhynchus* in captivity, I felt convinced that when completely submerged in water the creature relied to a considerable extent on the so-called sense of touch. From that opinion, I refrain to waver even now; further than to suspect and predict the existence of a permanent sixth sense functioning in unison with the sense of touch, and that, possibly, of a primary rather than of a secondary nature.

My reasons for such belief evolved from circumstantial evidence surrounding the many unsolved secrets pertaining to this primitive animal's singular habits, both on land and beneath the water.

During a brief controversy relating to the sense of smell of *Ornithorhynchus* searching for food in the bed of a river, the question arose as to whether that animal obtained its prey exclusively by sense of touch or in conjunction with the sense of smell. At that time, all participants in the discussion were positively bound to theory, no previous attempts whatever having been made with a practical view to elucidate the problem.

Not feeling inclined to pause at a dead end at that stage, I there and then decided to create a crude contrivance wherein to investigate systematically, without undue interference with the selected subject's natural behaviour. At the outset I was well aware that the intended captive would be nervous and excited, but concluded that such unavoidable conditions might be counterbalanced to some extent, by liberating the creature suddenly into fifty gallons of cool, fresh water, simultaneously with the critical time of test. At least, I imagined that a sudden stimulant of that nature would lessen the shock somewhat, if only temporarily, as my presence beneath the water would be unsuspected by the animal. However, when all was in readiness for the try-out, I obtained an uninjured adult female Platypus from a burrow nearby, and so as to give the specimen ample opportunity of thoroughly registering or recording the dread smell of human hands (to say nothing of the seeing and feeling of same), before liberating her into the tank, I handled her repeatedly and deliberately, occasionally rubbing my hands, back and front, over her sniffing nostrils, besides frequently fingering

her sensitive lips; all this with a notion that if her sense of smell above water was even fifty per cent. less efficient beneath, she might be expected to shy clear the instant she came in contact with the submerged hands that had just previously overhauled her. But such was not the case; in fact quite the reverse occurred, and to the marked astonishment of several onlookers the perturbed subject instantly sounded, then after probing her way systematically, if not feelingly, along the sandy bottom of the test tank, finally reclined leisurely beneath the unscrupulous hands that, only a few minutes earlier, were beyond doubt the dread of her precious life. (See confirmatory illustrations. Cinematographed by Mr. J. S. P. Ramsay).

During that uncomfortable try-out, the creature swam several times to the surface for a timely blow, only to repeat similar manoeuvrings on each occasion that she decided to again sound, and this, notwithstanding the fact that I had deliberately interfered with her several times below, with the specific object of forcing her into action.

At one time, while she was practically stationary on the sand beneath my hands, I placed my finger directly above, and within an eighth of an inch of her nostrils. But obviously, she was quite unaware of my presence or behaviour until my finger came in contact with the tip of her bill. "Cat-like" then, she arched her back, raised her tail, turned a kind of twisting somersault, and swam away. Later, again, she returned to the same zone exactly, and casually nuzzled my hands as if nothing unusual had transpired. Possibly, the finger tap on the snout did not seem to her to be any more than the sudden flip of a startled shrimp. Nevertheless, I am quite convinced that she did not return solely to satisfy her curiosity, nor purposely for shelter, as such a convenience was available elsewhere in the enclosure of which she, at times, took advantage.

Judging from all that transpired during the entire term of that experimental session, and after taking several concocted suggestions and theories into due consideration, I ultimately came to the conclusion that if the creature had any sense of smell at all beneath the water, then she certainly did not display the slightest suspicion of possessing any throughout the whole period of my investigations.

I observed also, that the previously suggested abnormal sense of touch was not nearly so acute as I had heretofore surmised it to be. That is to say, not to the degree of detecting immediate danger (at least, of a foreign nature) while wholly submerged. Still that special and, possibly, complicated organ may be extremely sensitive and quite indispensable to the creature while sifting mud, and selecting various suitable foodstuffs below. If that be the case (I take it as such), then it is seemingly safe to assert and record that an adult platypus has no enemies of consequence to fear beneath the water. Otherwise, and apart from my observations, it is somewhat doubtful if the docile *Ornithorhynchus* would have fared so well through the many evolutionary phases that may have transpired since pre-historic times.

What factor is it then, may I ask, that constitutes the stability of this freakish species prolonged existence? Is it because of a super-sixth sense or simply because such creatures, apparently, fare well on that common commodity called mud? With the proviso that the former trait is responsible for the latter, I suggest both.

As regards the five known sensory organs of a platypus when on land, or afloat, I have little to add, except direct confirmation, if necessary, in support of the fact. But, beneath the water, where mud is quite possibly consumed regardless of taste, I suggest that the sense of taste should be considered as not functioning, and that it remains so until the animal swims to the surface, where it

then leisurely masticates the food previously packed hurriedly for that purpose in the cheek pouches, while below.

Of the remaining two senses, "Seeing and Hearing," as far as I could ascertain, both were temporarily short circuited, so to speak, while the creature remained submerged, principally by means of a watertight facial furrow which simultaneously envelopes alike the orifice of both ear and eye directly the creature decides to sound.

While submerged, the animal appears to be positively devoid of the sense of hearing. I came to that conclusion after endeavouring to attract its attention by shouting out at the top of my voice, while the creature clamoured gropingly about my submerged hands and around the exterior surface of the glass helmet enveloping my head, without demonstrating the slightest symptoms of agitation whatever.

Vibration of voice, if any, made no apparent impression on the sluggish subject either.

Testing the sense of sight proved rather complexing to me. However, I came to the conclusion that, strictly speaking, the animal cannot see, and, unless capable of differentiating between light and shade, through the aforementioned tightly closed furred furrows (as man on earth can through casually closed eyelids), then it seemingly does so, and to perfection, through the medium of a sixth sense.

As a guide to critics interested in this subject, let me state here that it is practically impossible to accurately test the sense of smell of a freshly handled platypus by introducing natural foods into the enclosure. Hence the omission of such a scheme in my cinema venture. Of course a test could be made, and no doubt successfully too, with a contented undisturbed captive, but I have intentionally left that opening to other enthusiasts perchance intent on checking off carefully my slender theoretical views.

If, as was previously supposed, the sense of touch is confined solely to the procuring of food, and that all earthly smells are quite indiscernible by the creature while it remains submerged, what then of that suggested special sense of touch with its abnormal nervous system? Why abnormal, anyway? That is the query. If man and animals are credited with possessing a sixth sense, what constitutes or governs that sense? Is it not reasonable to claim that it is governed by a nervous system, precisely as other senses are said to be? There is either a sixth sense, or there is not. If not, then we must hopelessly muddle through with that loophole word Instinct, and appear wise when confronted with a set theory. On the other hand, if we are justified in proclaiming the existence of a sixth sense, then permit me to add my quota to assist in confirming that fact. As an example, in this case, I prefer substituting for the word Instinct, the phrase "Sense of direction," principally because of the simplicity of explanation of what appears to me to be both practical and feasible, particularly so in connection with the habits of the world's most highly specialised mammal *Ornithorhynchus anatinus*.

To assert as above without some explanation pertaining to the whims of our wonder mammal, occurs to me as deliberately evading the issue, or perhaps I should say, the duty of a Field Naturalist so engaged. However, to be as brief as my ability permits, the following explanations, though ungarnished, may appear of some interest to scientifically trained minds keen on coining a more befitting phrase than the haphazard substitute that I have already suggested.

In a previous test case I proved beyond doubt that a platypus in captivity will devour in assorted foodstuffs (not including mud), half of its own weight nightly. Now if similar quantities are consumed at large, then, as a platypus

providore, it is beyond my imagination to comprehend how the creature obtains such an enormous supply, unless mud be included in the bill of fare as a kind of "fill-up" necessity, if not a staple food.

Of the many platypus that I have had occasion to dissect, the intestines and stomachs of most, especially the robust and healthy-looking specimens, contained much mud, and apparently little else, while the cheek pouches of all bulged, crammed with grit, mud, and crunched aquatic creatures, seemingly of minute forms.

On one occasion, in the presence of the late Charles M. Hoy, I extracted a small shrimp (entire) from the stomach of a foraging female platypus, collected at noon. Possibly, the Crustacean slipped down accidentally. Nevertheless, that query does not upset my theory, that platypus are indiscriminate mud-suckers, but tends rather to strengthen my contention, that the sense of taste is apt to cease functioning beneath water.

Live shrimps collected direct from the feeding grounds of platypus are readily devoured by *Ornithorhynchus* in captivity. In fact, most specimens prefer them to indigenous river bank worms or other known varieties of food supplied. From personal observation, I can vouch for one male platypus in captivity that lived entirely on dead raw prawns (salt water variety) for eight months, and was then, apparently, in splendid condition. Furthermore, it is said to have lived four months longer when (unfortunately for the experimenters) it escaped from its neglected enclosure, and this despite the audacious assertion that platypus will not live in captivity. The above information, abbreviated, may suffice for the present. There are other complicated confirmatory clues that I could divulge first-hand to strengthen my theories, if space were available or permissible. That aside, I have no hesitation in stating here, that platypus are confirmed mud suckers, and, that part of their living foodstuffs are both discovered and secured by that, may I add, pre-historic vacuum-like process enhanced twofold by a sixth sense.

Apart from other perceptible instances, in this isolated test case alone, a sixth sense appeared to predominate even above the sense of touch, while the other four senses remained practically dormant or useless the while. Such conditions, then, should permit the creature to concentrate its energy more deliberately, and with less confusion on the two active organs of sense that are probably mutually dependent one on the other for an undisputable primary purpose, i.e., the power of tracking and taking prey. Why not?

Again, as mud is seemingly a necessity, if only to appease an enormous appetite ("What won't fatten will fill!"), why an abnormal nervous system of touch? Surely the presence of mud could be readily determined by a pud-dling platypus, without such special features as super-sensitized abnormally-formed lips, etc. Evidently, in framing the law, "The survival of the fittest," fleetness of foot and ferocity were not considered essential factors, and that's that!

In conclusion, if a platypus must actually touch a shrimp, or other active prey of the kind it so relishes and thrives upon in captivity, then, to my mind, such wary crustacea, etc., would be rarely taken alive at large. On the other hand, if a sixth sense functions to assure direction, then I consider that it would be quite possible for a platypus to collect half of its own weight in live animal foodstuffs nightly. And not without.

FIELD NOTES ON NATURAL HABITS OF ECHIDNA.
(TACHYGLOSSUS ACULEATUS).

By HARRY BURRELL, C.M.Z.S.

In his book, "The Mammals of South Australia" (page 32), Dr. Wood-Jones, referring to the deposition of *Echidna* eggs, states:—"It would appear to be very probable that the elongated muzzle of the mother *Echidna* is used for this purpose."

At present I can neither confirm nor dispute that suggestion. But, as I am a convert to the slogan, "Team work wins," perhaps the following information will strengthen the standing theory that the egg is simply deposited directly into the pouch, fundamentally.

On 13/9/24, at Manilla, N.S.W., I examined the pouch of an *Echidna*, and there discovered an embryo measuring 34 m.m., from tip of snout to tip of tail (say two or three days old). The empty egg-shell was in the pouch also, and, after being extracted, examined, and replaced so that it might remain moist for the morrow's cinematographing, there it remained intact for exactly twenty hours longer before being forcibly extracted again, and preserved finally for future reference.

Now what struck me as being extraordinary at the time was the seeming neglect of the mother in permitting the shell, or capsule, to remain there so long (at least three days), if she was so accustomed to manipulating unhatched eggs with her muzzle at the time of laying.

No one can disprove the fact that an *Echidna* is capable of probing her snout into any part of her pouch. She can do so, and with simplicity, just as she can take hold of a flattened egg-shell by the only available means—her mouth. I took some pains to prove that point, long since. That aside, the fact of her not having removed the shell strengthens my belief that the muzzle was never intended by nature for use in transporting egg-shells at any given stage, full or empty.

As regards Professor Wood-Jones's assumption (*loc. cit.*) that "it is obvious that the egg has no power to effect its own translation from the cloaca to the pouch, unless it rolls into it or is deliberately put therein." I concur that this is obviously correct, and I wish to record here, as I have long since done elsewhere in respect of other of our mammals, that it is evidently deliberately placed there by nothing more than a protruding fundament. Excreta is placed there in a like manner. That I know!

The egg-shell, filled out while moist, measured, length, 17 mm., width, 15 mm.

Temperature of female *Echidna* (ventral) 90°.

Temperature of pouch (containing young) 84°.

Incidentally, the only theory to the contrary for discussion now, as far as I can ascertain off-hand, is whether the shell is purposely left in the pouch as a kind of irritant to agitate the mammary glands and baby alike, or finally to dissolve itself into a lappable pap. Mammy is not worrying, anyway!

[Mr. Burrell's interesting theories in this and the preceding paper are given in his own words, no attempt being made to edit or adapt. Those who know Mr. Burrell personally will recognise the value of his theories and suggestions, coming, as they do, from a man who has spent many years in exhaustively studying the monotremes in their natural surroundings—Ed.]

A NATURALIST IN NORTH QUEENSLAND.

By A. F. BASSET HULL.

(Plates iii.-v.)

Seeking in the field for facts in support of some theory, one is occasionally faced by results that can only be described as negative. Such results, however, have a distinct value, either in tending to disprove the theory or in showing the faults in its construction, and thus assisting the observer in rendering the edifice proof against the winds of adverse criticism. Such a result attended an expedition undertaken by the writer last year, which occupied the greater part of three months and entailed travelling upwards of three thousand miles.

For some years past I had been studying the relation of the Loricata fauna to the rock which formed the littoral, and had satisfactorily proved that in southern Australia at least the sedimentary rocks favoured a profusion of both species and individuals, while the igneous rocks were very sparsely populated by these interesting multivalves (1).

In the winter of 1923, Mr. Charles Hedley and Professor H. C. Richards, in the course of a trip from Brisbane to Thursday Island, spent some days in studying the Flinders Group of islands, near Princess Charlotte Bay, about 120 miles north of Cooktown, Queensland. On his return to Sydney, Mr. Hedley informed me that these islands were composed of sandstone and resembled in a remarkable degree the foreshores of Port Jackson. As sandstone country is most favourable to Loricates in New South Wales, and I was aware that the mainland of Queensland in the vicinity of the Flinders Group is granitic in formation, I determined to visit the Group to see whether my theory held good in this far northern region.

Early in May, 1924, accompanied by Mr. Gerald Lewers, a keen young collector of Loricates, I left Sydney and proceeded to Bowen, where I proposed to supplement some research work conducted during October, 1923 (2). The weather was unfavourable, strong south-easterly winds blowing for the week after our arrival, but when the wind had moderated somewhat we left Port Denison in a 24 ft. sailing boat belonging to Mr. Cecil Hall, accompanied by the owner and Mr. E. H. Rainford, the veteran collector of fishes and marine invertebrates, shaping our course for the islands of the Whitsunday Group. We anchored for the night under the lee of Saddle-back Island (Plate iv., fig. 5), and in the very early dawn, owing to warning bumps from a rock that the falling tide brought too near to the boat's keel, we pushed out and landed in a sheltered cove on Armit Island, pitching our camp on the wide coral beach under the shade of some tall casuarinas. Here the mean height between low and high tides is about 15 feet, the spring and cyclone tides rising considerably higher.

(1). Proc. Linn. Soc., xliv., 1924, ix.

(2). New Queensland Loricates. Proc. Roy. Soc., Q., xxxvi., 1924, 109.

The beach is carved into three benches, indicating the neap, spring, and cyclone limits, the latter extending some distance into the fringing growth of grass, convolvulus and casuarina scrub, where pumice stone, cuttlefish bones and dead shells mark the heights to which the storm-driven waters rise (Plate v., fig. 9). Like most of the islands in this group, Armit Island has a wide fringing coral reef on the western and southern sides, and two days were spent in examining these reefs at low tide. When the tide did not serve we fished, with indifferent success, or went into the scrub in search of birds and land shells. The birds were few, both as regards species and individuals. Several huge nest-mounds of the Scrub-Fowl (*Megapodius duperryi*) were seen, together with the birds, and they seemed to be in use, freshly accumulated material being scattered all over the tops of two mounds, but we did not disturb them or search for eggs. Some deserted mounds, covered with low scrub, were also seen. A pair of Ospreys (*Pandion leucocephalus*), several Bar-shouldered Doves (*Geopelia humeralis*), and numerous Silver-eyes (*Zosterops*) were noted. On the shore at low tide some waders, Curlew, Whimbrel, Stints, etc., were seen, and several Crows (*Corvus cecillae*) cawed dismally to each other. Several species of land shells were secured including a large *Thersites*. On the third day we sailed over to Grassy Island and worked the reef for Loricates at low tide, returning to Armit Island in the evening. Another day was spent on the reef of that Island, and on the sixth day out from Bowen we returned to that port. Armit Island appears to be chiefly diorite and Grassy Island basalt. The net results in Loricates were fourteen species, several of which were represented by two or three specimens only. Approximately only two per cent. of the stones turned and examined yielded any specimens, and none were found on the living coral. A few were found under loose blocks of dead coral, but the majority of the specimens were taken from the scattered diorite or basalt stones lying on the reef, which for the most part was dead, only the outer fringe facing deep water showing any notable quantity of living coral. A most interesting discovery was made on Armit Island. In 1923 I had found a new Plaxiphorid at Stone Island, Port Denison, which I named *Aerilamma primordia*. It obviously belonged to the same family group as the great hairy-girdled shells that are so common on the surface of rocks just below high tide mark on the Australian coast from Tweed Heads to Tasmania, and round the Leeuwin to Fremantle. But the new species was very small and occupied a most unusual station, being taken from under small stones embedded in coral sand at low water. Certainly only a few examples were found, seven in all. Two or three were taken under stones on the reef at Armit Island, but on examining the little rocky point shown in Plate v., fig. 9, we discovered it to be the home of numerous specimens of this shell, tucked away in the crevices of the rock, occupying spaces between clusters of oysters, or clinging to the bare face of the stone, in the manner one would naturally expect from a well-conducted member of the family! The rediscovery of the long lost *Haploplax adalaidensis* (3) on Grassy Island was another noteworthy incident of this visit.

The results of this part of our expedition were positive, inasmuch as they proved the correctness of the assumption that the igneous rocks were not favourable to the Loricata fauna. The total number of species collected was fourteen, five of which are common to the whole coast of Queensland from Gladstone to Thursday Island. Considering the sheltered position of the reefs examined, the two kinds of country rock, and the masses of dead coral lying loose on the

(3). Iredale and Hull, Aust. Zool., iii., 1924, 294.

reefs, one might have reasonably expected to find a large number of individuals of the species found. This, however, was not the case, the total number of each species, excepting the five common ones, not exceeding twelve and ranging as low as three. Compare this result with what could certainly be achieved in Port Jackson, where four active collectors working on four days could be certain of taking thirty species, of which fifteen would be obtainable by the hundred or even thousand!

A few days were spent in the vicinity of Bowen collecting under adverse weather and tide conditions, and on the 27th of May we left for Townsville, there to join the s.s. Kallatina, which trades between Brisbane and ports in the Gulf of Carpentaria, calling at the Flinders Group on the way. Leaving Townsville at midnight on the 28th and calling at Cairns and Cooktown, we sighted the high peaks of Stanley and Flinders Islands in the afternoon of the 31st. The only inhabitants of the whole Group are the four white skippers of Morey & Co's beche-de-mer luggers, the native crews (mixed aborigines, Papuans, etc.) and a few aboriginal women. All are located at the firm's station on Flinders Island. Mr. Markwell, Morey & Co.'s representative, made us welcome, showed us a suitable spot for camping, with abundant wood and water, and assigned to us Charlie Kumalla, a Bathurst Head aboriginal, as gentleman help. "Kumalla" (Kumera) means "potato," and Charles of that lowly appellation claims Kingship over Flinders Island, but his claim is disputed by his uncle Whaleboat, as merry an old monarch as his nephew is saturnine. The Court of Claims, as represented by Mr. Instone, whom we subsequently met at Ninian Bay, considers neither claimant entitled to the throne or the brass crescent that forms the regal insignia. Whaleboat emphatically asserted "Halla this islan belonga me," and when I asked him how many of the original tribe remained, he had to admit that there were only nine, including himself, and some of them were "alonga mainlan." Both kings (Plate iii, fig. 1) were sad gossips, and related scandalous stories about their neighbours, at least we gathered that they were scandalous from the frequent references to "poliss" in the narratives, and the mischievous or malevolent grins and gestures which accompanied the stories. Our acquaintance with pidgin English was limited, so we missed much of the salter parts of the tales.

Having fixed up our camp we strolled along the beach next morning, and could scarcely realise that we were not in a retired corner of Port Jackson, so similar were the surroundings of sandstone rocks, weatherworn and rugged, and the stunted Eucalypt scrub with a few mangroves on the water's edge. As the tide fell we proceeded to wade out on the reef in search of Loricates. There was some loose shingle about high water mark, but below that we suddenly plunged into glutinous blue mud a foot or more in depth. This was not encouraging, but we persevered until we reached the outer fringe of the reef, which consisted of scattered lumps of dead coral on which a few large *Amphitomuras*, more or less eroded, were clinging. Here and there a living piece of coral showed that the reef was beginning to recover from the effects of the 1899 cyclone which was the probable cause of its destruction. Every time a stone or loose piece of dead coral was turned over the water was clouded by the disturbed mud, and the stones were found to be devoid of anything in the shape of a Loricata. After plodding over half a mile of this muddy reef we went back to the cleaner sand near high water mark, and there found a few specimens of *Ischnochiton luteicollis* and *Haploplax arbutum*. Charlie was then consulted and shown the specimens taken. "Oh, yes, plenty that fella he stop. Plenty good kaikai." In his "langus" the name of the shell was "Alwulli," but he appeared to be familiar only with the large *Amphitomura*, the smaller species, of course valueless for

food, being unworthy of notice. He did not know where we could get any but the large shells. This was disheartening, but from day to day we persevered, examining miles of the shores of both Flinders and the other large island of the group, Stanley Island. The results were meagre in the extreme, three examples of a *Lucilina*, one *Lophochiton*, and two *Acanthochitons*. The two small shells found on the first day were plentiful enough, but the net result amounted to seven species, three very common, and four very scarce. Consequently the question I set out in the beginning of this narrative was answered in the negative.

The reasons are fairly obvious. In the first place, coral is not a congenial base for Loricates, most of which are vegetable feeders. Living corals are rarely associated with the class of seaweed affected by these animals, and therefore one can only expect to find the carnivorous species, such as *Cryptoplax*, *Schizochiton* and some *Acanthochitons* associated with living coral. Dead coral is rarely found weed-bearing, and is generally very muddy, and very few species of Loricates care for muddy situations.

It therefore becomes necessary to modify the conclusion, "That the Loricates exhibit a marked preference for sandstone, limestone, and other sedimentary rocks, the number of species exceeding twenty-five, and there being a wealth of individuals," by the addition of the proviso that the conditions of suitable food supply and clean water are present.

One day was spent in visiting Clack Reef, a few miles to the eastward of Flinders Island. Markwell conveyed us to the reef in his lugger, but we found nothing of interest there. About two miles of "nigger heads" outline the reef, which is chiefly composed of dead coral. The wind was blowing fresh from the south-east, and our investigations were necessarily limited to the vicinity of the nigger heads, where we found nothing but the *Amphitomas*, some of which exceeded five inches in length, but all were eroded by the action of weather and exposure during low water.

We climbed to the top of the 1,000 ft. hill on Flinders Island, and noted the remarkable absence of living creatures. No butterflies, or lizards were seen, but grasshoppers and numerous green ants on the trees were met with. The birds were few, both in numbers and species, the common Crow (*Corvus cecillae*) being the most numerous, hanging about our camp on the look out for scraps. Other land birds noticed were the Singing Honeyeater (*Ptilotis sonora*), Sun Bird (*Cinnyris frenata*), Kingfisher (*Alcyon pusilla*), Bar-shouldered Dove (*Geopelia humeralis*), Kestrel (*Cerchneis cenchroides*), and a few Swallows and Martins. On the shores were a few Reef Herons, Silver Gulls, Lesser Crested Terns, Caspian Terns, Pied Oystercatchers, Large-billed Stone Plovers, Sea Eagles and Ospreys. None of these species was represented by more than two pairs, most were in pairs only. The aborigines asserted that there were no animals such as opossums, rat kangaroos, or rats on the islands. Land shells were scarce, excepting one large *Thersites*, dead shells of which were common, but we failed to obtain any living specimens, although we employed the native women to search for us, as they use this snail for food when they can get it.

Close to our camp is a "bench mark," established by H.M.S. Dart in 1899 (Plate iv., fig. 7), and on the rocks near by some natives have imitated the blatant tourist who loves to smirch the scenery with his objectionable name (Plate v., fig. 10).

We were able to agreeably supplement our rations with real turtle, in soup, steaks, and stew, all of which were most palatable. I also essayed a beche-de-mer soup which took eight hours of preparation, but was worth the trouble! The dried sea-slug requires soaking in fresh water overnight; it is then cut into thin slices and boiled over a slow fire for eight hours, by which time it has dis-

solved into a rich jelly. It has very little flavor of its own, its value lying in its thickening and enriching qualities. My soup was "flavoured" with turtle meat, cut into small blocks, a dove, onions, dried herbs, and the usual condiments. It certainly was most appetising, all hands having three "goes" at it.

Having exhausted the Loricata possibilities of the Flinders Group, we arranged with Markwell, who was going out to the Barrier to provision his other luggers, to take us with him, and if possible carry us on to Cooktown, 120 miles south, calling at Lizard Island on the way. After a breakfast of goat chops, we left in the lugger at 9 a.m. on 12th June. The cold south-easterly wind that had been blowing almost without intermission ever since we reached Bowen dropped to such a light air that the lugger did little more than drift eastward, and it was dusk when we anchored under Cape Melville. On the way down we saw several turtle and dugong, and the crew had some willing chases in the dinghy, but failed to capture anything. Their harpoons were serviceable weapons, with iron barbed heads, so fitted to long shafts that when an animal was struck the barb remained in while the shaft was pulled out of the socket, and, attached by a line to the barb, with a long line in the hands of the harpooner, hampered the movements of the animal when it sounded, and indicated its return to the surface. I have recently seen it stated in the Sydney *Bulletin* that the dugong is nearly extinct in Queensland, but this is quite erroneous. I saw several, and Markwell informed me that they are plentiful in the shallow waters of Princess Charlotte Bay. There is little encouragement offered to the hunter to systematically carry on a dugong fishery, the price of the oil being too low to make it a paying proposition. The crews of the luggers stationed at Flinders Island frequently secure dugongs for food, and I saw fresh hides there, and used some of the oil for frying fish.

The next morning we started with a light westerly wind, and reached Pipon Island. A lightship formerly anchored here was swept away by a cyclone, and the crew were lost. An automatic light now stands on the end of the reef, and we landed on the island where the light-keeper's quarters used to be, and found many wading birds, including Pelicans, Oyster-catchers, Curlews, etc., all of which moved out on the sandbanks, keeping well away from the intruders. A pair of Caspian Terns had their nest, containing two eggs, on the island just above high water mark. This evidence of a sea-bird breeding in June appeared worthy of remark, but Markwell turned up his log book in which he had entered useful memoranda as to possible food supplies, and gave me the following interesting data:—"10th August 1923, on No. 2 Reef, N.E. of Flinders Island, birds with fresh eggs and some dropped eggs while hovering overhead. 1st December on Stapleton Island off Barrow Head, eggs and young birds. 19th May, 1924, on Pipon Island fresh eggs." We know from the records of Jukes and Macgillivray that there are at least two breeding seasons on Raine Islet, April-May and October-December. My discoveries and Markwell's notes indicate that almost at any time in the year one may find sea-birds breeding somewhere along the Great Barrier Reef. Our search for Loricates at Pipon Island was not rewarded to any extent. The large *Amphitomurus* were plentiful on the nigger heads, and Cecil Hall found a solitary *Schizochiton* in a crevice in a block of dead coral on the reef. This was the first living specimen of this curious vermiform Loricata I had seen, and I looked forward with interest to the possibility of finding it in quantity. The wind continued light, veering to the S.E., and the current being against us we drifted back to Cape Melville and anchored at 3 p.m. Lewers went out with some of the crew after dugong, and landing on Boulder Rock, a great pile of granite about a mile from the Cape,

found the Silver Gulls nesting there. The whole of Saturday, 14th June, we crawled along with a light S.E. wind; landed on Barrow Island, and found a nest of the White-headed Osprey containing two eggs. Although the shore of this island was strewn with loose stones, I found no Loricates of any species, not even the common big fellow. By evening we had reached Noble Island, a rugged mass with three peaks of varying altitudes, the highest about 400 feet. In the morning we landed, and found a shaft and tunnel where wolfram was mined during the war. An Osprey's nest containing three eggs was found by Lewers on the lowest peak. The beautiful Macleay's Kingfisher was seen, and a rail, probably *Hypotaenidia philippensis* was flushed from the long grass. Some of the crew found suitable wood for fire-making, and they instructed Lewers in the art in which he soon became quite proficient.

At 7.30 a.m. we left Noble Island, and with a freshening S.E. wind beat out to the Howick Group of Islands, landing on No. 1 Island at low water at 1 p.m. Here there is a magnificent live coral reef over which we wandered selecting specimens for the collection of the Great Barrier Reef Committee. It was a gorgeous garden of colour that was spread out before us, and we soon had our kerosene tins full of specimens. Pushing on to the eastern end of the reef we found a dead patch, with many loose stones embedded in the sand. Here I found the natural haunt of the *Schizochiton*, taking twenty fine specimens, together with a few large *Lucilinas*, and some specimens of *Lophochiton granifer*. Lewers secured half a dozen large mangrove crabs, which we cooked for tea and found delicious. Boughton or No. 2 Island was also visited, being separated from No. 1 by a very narrow channel.

Next morning, June 16, we started for Lizard Island, which loomed blue on the distant horizon, but a stiff south-easterly wind met us as we left the shelter of the big Howick, and after beating into a heavy sea for an hour we were forced to return to shelter, anchoring in the channel between Boughton and Coquet, or No. 3 Island. There is an automatic light on this island, and an Osprey's nest was built on the platform, but had been pulled down by the patrol steamer. The birds had rebuilt in a high mangrove, and the nest contained one egg, and a Japanese sandal reposed amongst the odds and ends of the lining. Silver Gulls were nesting here, fresh eggs being found. As the tide fell we worked down the reef, mostly of dead coral debris, and found the *Schizochitons* in numbers, several handsome *Lucilinas*, and seven other species of Loricates. Altogether this day's captures equalled the total takings on the Flinders Group. The next day we were joined by the Alidina, another of Morey's luggers, which had run in from the outer Barrier Reef for shelter. Together we ran round to the lee side of Howick No. 1, and there we stayed for four days, pitching to the choppy seas, swept by bitterly cold rain squalls, in the intervals of which we fished and cooked our meals under difficulties. We had turtles, crabs, and plenty of cod and snapper, so our days were not without their compensating moments. Besides, the time was of the greatest value to me, as I was able to make good specimens of the *Schizochitons*, which require a great deal of manipulation while drying to preserve the girdle and keep it from shrinking. Each specimen, after the animal had been removed, was bound with tape on a slip of wood, and was subsequently removed, the girdle pressed out, and replaced on the slip six times, at intervals of about ten hours. A fine range of well-preserved specimens was the ultimate result. The fishing, which started fairly well with 12 to 15 lb. snapper, began to fall off as some sharks came round and snapped the snapper on the way to the surface, leaving only a head or half a fish on the line. The nights were far from comfortable, as it was too

wet to sleep on deck, and the small stuffy cabin was not only overcrowded with ourselves, but was infested with huge cockroaches which nibbled our toes and brushed our faces with their offensive antennae. Lewers and Hall went with some of the crew in the dinghy and examined the near reef, but it was muddy and no Loricates were seen. At 8 a.m. on the 19th June, the wind still blowing strong from the S.E., an Albatross came and sat on the water just astern of the dinghy which was tossing at the end of the painter a few yards from the lugger. The bird had a dark bill, greyish-white feet, black wings, the colour extending right across the back, the tip of the tail was black, and the whole under surface was white, and a dark greyish shading extended from the shoulders round the neck, almost meeting under the chin. The head was greyish-black. It was much disturbed by small sharks, and frequently rose, circling round a little, and then settling down again. It answered fairly well to the description of *Diomedea chrysostoma*, except for the neck shading. The mate of the Alidina, a Filipino, said he had seen a similar bird at Raine Islet and also off Cairns. The record is interesting, as occurrences of Albatrosses so far north are rare.

On the following day, the wind showing no sign of abating, we decided to run back to the Flinders Group, as there was no apparent hope of getting further south. Leaving the anchorage at 8.30 a.m. we reached Point Barrow at noon, and anchored in Ninian Bay, going ashore and calling on Mr. Instone at "Abbey Peak" in the afternoon. A pair of Ospreys had built a huge nest in a large dead tree near the landing place. Lewers climbed up to it, but it contained no eggs, having been recently re-lined ready for use. The foreshore was very muddy, and the rocks granite, on which a few *Amphitomurus* clung; one or two small *Ischnochitons* were also found. A small crocodile was seen swimming across the shallow bay, and we saw the skull of one Mr. Instone had shot, the animal measuring 14 ft. 6 in. For two days it blew almost with the force of a gale, and we had to shift our anchorage further inshore. Early on Sunday, 22nd June, we left the Bay, beating out to Cape Melville. Rounded the Cape at noon, and ran under double reefed mainsail and jib only, whipped by violent squalls from the high hills of bare granite which threatened more than once to "take the sticks out of her," and reached the shelter of the islands at 2 p.m., our morning's run of forty miles in four hours being somewhat of a record.

As illustrating the facility with which the aborigines can communicate by means of their sign language, the following incident may be related. While we lay in Ninian Bay, about half a mile from the shore, some aborigines appeared on the beach and signalled. One of our crew explained that they had a little pig with a white mark for sale. No voice from the shore could possibly be audible in the strong wind at that distance. The dinghy was sent ashore, and the pig duly arrived. It was black fore and aft, with a white band encircling its middle. After some bargaining the pig was purchased for ten sticks of tobacco, value under three shillings, and its former owners returned to the shore. The dinghy was brought back, and the pig left to roam the deck and make itself at home. Some time later I was looking out and saw a small black object swimming shorewards; it was the pig. The dinghy was hastily launched and the pig recaptured almost on the point of exhaustion. Contrary to the generally accepted belief that a pig will cut its throat with its fore trotters if it attempts to swim, this particular example did not exhibit even a scratch on its throat.

The following five days were spent in further investigation of the reefs of the islands, but the tides were unfavourable, and the wind bitterly cold. On the 27th June the three luggers which had been out on the Barrier returned with

their cargoes of beche-de-mer and trochus shell. Markwell classified the varieties of beche-de-mer as follows:—Deepwater Black, Barrier Red, Teat-fish, Prickle-fish or Culla-culla, Mumma teat-fish, Mainland black, Sand Red, Tiger-fish, Lolly, Sandfish, Chalkfish, and Curryfish, the quality and value descending in the order given. As evidencing the recuperative nature of the fishing grounds Miller, one of the skippers, told me that he had fished over a section of reef, and returning a month later had got a good haul of beche-de-mer on the same ground. He had taken nine bags of trochus shell and two months later got ten bags from the same area.

On 28th June the Kallatina arrived on her northward voyage, and we decided to go with her as far as Thursday Island, leaving at dawn, and arriving at the island on the following afternoon. A week was spent in collecting on the shore of the island, where we took no less than seven species of Loricates, a most unexpected result, as the great tides and sweeping currents would suggest unfavourable conditions. The big *Amphitomurus* were there literally in thousands, but the other species were not numerous in individuals. By the courtesy of Mr. Crawford, the Collector of Customs, we were enabled to visit Booby Island, about 20 miles west of Thursday Island, a rugged rock on which there is a lighthouse. We saw only one Booby, the Brown Gannet, there, and a few Crested Terns. In a rift in the rocks there are a few Ficus trees, and from one of them a large bird was flushed. It was light, almost white in colour, bluish on the head and back, and had a long tail. Mr. Norgate, the lighthouse keeper, told me that it was a New Guinea Pheasant, and was not uncommonly seen passing over from New Guinea to the mainland. It was evidently one of the large Pheasant Coucals of New Guinea, but no specimen has been recorded as taken in Australia.

I was asked to give an address to the Thursday Island branch of the Royal Geographical Society on the aims and objects of the Great Barrier Reef Investigation Committee. A large audience assembled in the schoolhouse, and listened very attentively to my remarks. As everyone on the island is directly or indirectly interested in the solution of the various economic problems of the pearl shell, trochus and beche-de-mer industries, much good may be expected from the formation of this branch of the Society. Mr. Hocking, one of the oldest pearlshellers on the island, has a remarkable museum in which he has beautiful series of exhibits showing the various products of the reefs in their natural and manufactured states. I noted a new object made from the former waste keeled edges of the trochus shells, which are now cut into ovals, polished, and stained pink, amethyst, or green, and make most attractive imitation cat's-eyes. We met with much hospitality from the residents of Thursday Island, and the Collector of Customs placed one of the Department's cottages at our disposal, thus giving us every facility for handling and preparing our specimens. We left the island by the Kallatina on her return from the Gulf Ports on 7th July, and journeyed through to Brisbane in this small but very comfortable and well-found boat.

THE LEPIDOPTERA OF YEPPON.

By A. JEFFERIS TURNER, M.D., F.E.S.

The Lepidoptera of Australia must remain incompletely known until there are resident collectors in every considerable area. At present this is far from being the case. In Queensland the lepidopterous fauna of the coastal strip from the Tweed River to Gympie is fairly well-known, though very far from completely. For the purposes of this paper we may term this the Brisbane fauna. Next to this we know most of the fauna of the coastal district around Cairns, though still less completely. In the Central district we know many species from Duaringa, from the work of the late Mr. George Barnard and his sons, but have with hardly an exception no records from the coastal district. Advantage was taken by several entomologists of the recent Congress of Ornithologists to investigate the lepidoptera of the district around Yeppoon. This watering place is surrounded by open forest and jungle. To the immediate north is a range of low coastal hills jungle-covered and extremely rich to the entomologist, though it is to be feared that much of it will before long be cleared. Here Mr. W. B. Barnard and myself collected from October 17th to 21st, and again from the 26th to the 29th. From October 22nd to October 26th we collected around the camp at Byfield, a banana-growing district, about 25 miles to the north, also of mixed forest and jungle. Mr. A. Musgrave collected some lepidoptera in both localities, and Mr. R. Illidge helped us in compiling the list of Rhopalocera. The week after our departure, Mr. G. M. Goldfinch also collected at Yeppoon from November 4th to 8th. Taken altogether, this was an entomological foray of some magnitude, and the list of species here given is of some scientific value, for hitherto this district has been to the entomologist a *terra incognita*.

LYCAENIDAE.

Candalides xanthospilos Hb.
Thysonotis taygetus Feld.
Nacaduba perusia Feld.
Nacaduba ancyra Feld.
Nacaduba berenice H.-Sch.
Euchrysops cnejus Fab.
Lampides boeticus Lin.
Chilades trochilus Freyer.

Zizina labradus Godart.
 **Miletus apelles* Fab.
Ogyris amaryllis Hew.
 **Arhopala amytis* Hew.
 **Arhopala meander* Bdv.
Deudorix diovis Hew.
 **Hypolycaena phorbas* Fab.

PIERIDAE.

Delias argenthona Fab.
Elodina parthia Hew.
Huphina perimale Don.
Appias ega Bdv.
Catopsilia gorgophone Bdv.

Catopsilia pomona Fab. f. *crocalebram*.
Terias libythea Fab.
Terias hecabe Lin.
Terias smilax Don.

NYMPHALIDAE.

<i>Danaiida archippus</i> Fab.	<i>Hypocysta pseudirius</i> Butl.
<i>Danaiida affinis</i> Fab.	<i>Ypthima arctous</i> Fab.
<i>Danaiida petilia</i> Stoll.	<i>Melanitis leda</i> Lin.
<i>Danaiida hamata</i> Macleay.	<i>Eulepis sempronius</i> Fab.
<i>Euploea tulliolus</i> Fab.	<i>Phaedyra shepherdii</i> Moore.
<i>Euploea corinna</i> Macleay.	<i>Precis villida</i> Fab.
<i>Acraea andromacha</i> Fab.	<i>Pyrameis kershawi</i> McCoy.
* <i>Mycalasis terminus</i> Fab.	<i>Hypolimnas bolina</i> Lin.
<i>Hypocysta adiante</i> Hb.	<i>Cupha prosope</i> Fab.
<i>Hypocysta irius</i> Fab.	

PAPILIONIDAE.

<i>Papilio sthenelus</i> Macleay.	* <i>Papilio parmatum</i> Gray.
<i>Papilio aegus</i> Don.	<i>Papilio lycaon</i> Westw.
<i>Papilio capaneus</i> Westw.	<i>Papilio sarpedon</i> Lin.
<i>Papilio leosthenes</i> Dbl.	<i>Eurycus cressida</i> Fab.

HESPERIDAE.

* <i>Toxidia tyrrius</i> Mab.	<i>Padraona flavovittata</i> Lin.
<i>Toxidia parvula</i> Ploetz.	<i>Badamia exclamations</i> Fab.
<i>Padraona heterobathra</i> Low.	<i>Hasora discolor</i> Feld.

LARENTIIDAE.

<i>Sauris hirsutata</i> Gn.	<i>Euchoeca rubropunctaria</i> Dbl.
* <i>Gymnoscelis acidna</i> Turn.	<i>Cidaria scythropa</i> Meyr.
<i>Chloroclystis cissocoma</i> Turn.	<i>Cidaria uncinata</i> Gn.
* <i>Chloroclystis nigrilineata</i> Warr.	<i>Xanthorhoe brujata</i> Gn.
<i>Eucymatoge ghosha</i> Wlk.	

STERNIIDAE.

<i>Eois albicostata</i> Wlk.	<i>Scopula despoliata</i> Wlk.
<i>Eois eretmopus</i> Turn.	<i>Scopula hypochra</i> Meyr.
<i>Xenocentris pilosata</i> Warr.	<i>Scopula innocens</i> Butl.
<i>Scopula desita</i> Wlk.	* <i>Trygodes catacissa</i> Turn.
<i>Scopula rubraria</i> Dbl.	* <i>Chrysocraspeda cruoraria</i> Warr.
<i>Scopula recessata</i> Wlk.	<i>Anisodes pallida</i> Moore.
<i>Scopula oppilata</i> Wlk.	<i>Pisoraca cryptorhodata</i> Wlk.

GEOMETRIDAE.

<i>Mixocera latilineata</i> Wlk.	<i>Pingasa emiliaria</i> Gn.
<i>Cymatoplex halcyone</i> Meyr.	<i>Terpna quadrilinea</i> Luc.
<i>Eucyclodes pieroides</i> Wlk.	<i>Rhuma subaurata</i> Wlk.

BOARMIIDAE.

<i>Cleora inflexaria</i> Snel.	<i>Boarmia symmorphia</i> Turn.
<i>Cleora compactaria</i> Wlk.	<i>Ectropis sabulosa</i> Warr.
<i>Cleora lacteata</i> Warr.	<i>Ectropis hemiprosopa</i> Turn.
<i>Cleora displicata</i> Wlk.	<i>Ectropis camelaria</i> Gn.
<i>Boarmia suasaria</i> Gn.	<i>Casbia albinotata</i> Warr.
<i>Boarmia externaria</i> Wlk.	<i>Rhinodia rostraria</i> Gn.
<i>Boarmia maculata</i> Luc.	* <i>Nadagarodes ochrophara</i> Turp.

OENOCHROMIDAE.

- | | |
|--------------------------------------|--------------------------------------|
| <i>Zeuctophlebia squalidata</i> Wlk. | <i>Epidesmia tryxaria</i> Gn. |
| <i>Dichromodes ornata</i> Wlk. | <i>Epidesmia transscissata</i> Wlk. |
| <i>Adeixis inostentata</i> Wlk. | <i>Oenochroma punctiunculis</i> Luc. |
| * <i>Eumelia aureliata</i> Gn. | |

SPHINGIDAE.

Protoparce convolvuli Lin.

EPIPLEMIDAE.

- | | |
|--------------------------------------|---------------------------------------|
| <i>Balantiucha decorata</i> Warr. | * <i>Monobolodes subfalcata</i> Warr. |
| <i>Balantiucha leucocephala</i> Wlk. | |

SYNTOMIDAE.

Eressa strepsimeris Meyr.

ARCTIADAE.

- | | |
|-------------------------------------|-----------------------------------|
| <i>Lexis nitens</i> Wlk. | <i>Termessa laeta</i> Wlk. |
| <i>Thallarcha leptographa</i> Turn. | * <i>Hemonia micrommata</i> Turn. |
| <i>Philenora aspectatella</i> Wlk. | <i>Schistophleps albida</i> Wlk. |
| <i>Philenora chionastis</i> Meyr. | <i>Utetheisa pulchella</i> Lin. |
| <i>Asura bipars</i> Wlk. | * <i>Maenas maculifascia</i> Wlk. |
| <i>Asura cervicalis</i> Wlk. | |

NOLIDAE.

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|-------------------------------|----------------------------|
| <i>Celama fraterna</i> Moore. | <i>Nola brunella</i> Hmps. |
| <i>Celama argentea</i> Luc. | |

NOCTUIDAE.

- | | |
|--------------------------------------|-----------------------------------|
| <i>Canthylidia pallida</i> Butl. | <i>Eustrotia amorphia</i> Butl. |
| <i>Agrotis poliotis</i> Hmps. | <i>Eustrotia ritsemae</i> Snel. |
| <i>Euxoa radians</i> Gn. | <i>Tarache detrita</i> Butl. |
| <i>Sideridis diatrecta</i> Butl. | <i>Callipyris drosera</i> Meyr. |
| <i>Sideridis abdominalis</i> Wlk. | <i>Corgatha figuralis</i> Wlk. |
| <i>Sideridis dentosa</i> Turn. | <i>Oruza semilux</i> Wlk. |
| <i>Cosmodes elegans</i> Don. | <i>Lophoptera squammigera</i> Gn. |
| <i>Calogramma festiva</i> Gn. | <i>Sarrothrips symmicta</i> Turn. |
| <i>Spodoptera mauritia</i> Bdv. | <i>Selepa celtis</i> Moore. |
| <i>Amyna natalis</i> Wlk. | <i>Selepa rhythmopis</i> Turn. |
| <i>Amyna octo</i> Gn. | * <i>Selepa geraea</i> Hmps. |
| <i>Caradrina obtusa</i> Hmps. | <i>Blenina lichenopa</i> Meyr. |
| <i>Aucha vesta</i> Swin. | <i>Calathusa basicunea</i> Wlk. |
| <i>Aucha triphaenoides</i> Wlk. | <i>Calathusa metableta</i> Turn. |
| * <i>Araeoptera pleurotypa</i> Turn. | <i>Earias smaragdina</i> Butl. |
| <i>Araeoptera canescens</i> Wlk. | <i>Nertobriga signata</i> Wlk. |
| <i>Trissernis prasinoscia</i> Meyr. | <i>Acontia amata</i> Wlk. |
| <i>Micrapatetis leucozona</i> Turn. | <i>Acontia transversa</i> Gn. |
| <i>Eublemma parva</i> Hb. | <i>Erebus dentifascia</i> Wlk. |
| <i>Eublemma pectorora</i> Luc. | <i>Grammodes justa</i> Wlk. |
| * <i>Eublemma curvata</i> Luc. | <i>Grammodes cooma</i> Swin. |
| <i>Catoblemma dubia</i> Butl. | * <i>Melipotis dubia</i> Butl. |
| <i>Catoblemma aplecta</i> Turn. | <i>Mocis frugalis</i> Fab. |
| <i>Cerynea trogobasis</i> Hmps. | <i>Catephia acronyctoides</i> Gn. |
| <i>Ozarba punctigera</i> Wlk. | <i>Tolpia conscitulana</i> Wlk. |

Rivula ommatopis Meyr.
Anomis sabulifera Gn.
Rhesala cyclostigma Turn.
Rhesala digramma Wlk.
Hyperlopha cristifera Wlk.
Othreis fullonica Lin.
Artigisa impropria Wlk.
Sandava xylistis Swin.
Sericea spectans Gn.
Hypaetra discolor Fab.
Anticarsia bolinoides.
Oxyodes tricolor Gn.
Hypertrocta variabilis Swin.
Prionopterina grammatis Meyr.

Meyrickiella ruptella Wlk.
**Tampa tephraea* Turn.
Homodes bracteigutta Wlk.
Heterormista modesta Swin.
Heterormista psammochrea Low.
Aginna circumscripta Wlk.
Hydrillodes lentalis Gn.
Progonia patronalis Wlk.
Simplicia robustalis Gn.
Nodaria armatalis Wlk.
Chusaris oculalis Moore.
Hypena gonospilalis Wlk.
Hyblaea puera Cram.

LYMANTRIADAE.

Porthesia galactopis Turn.
Porthesia fimbriata Luc.
Porthesia lutea Fab.

Euproctis habrostola Turn.
 [Taken on North Keppel Island.]
Lymantria reducta Wlk.

HYPSIDAE.

Digama marmorea Butl.
**Hypsa dama* Fab.

Hypsa plagiata Wlk.

ANTHELIDAE.

Anthela acuta Wlk.

LASIOCAMPIDAE.

Digglesia cycloloma Turn.

ZYGAENIDAE.

Pollanisus subdolosus Wlk.

Pollanisus viridipulverulentus Guer.

THYRIDIDAE.

Rhodoneura dissimulans Warr.
**Rhodoneura bastialis* Wlk.

**Addaea fragilis* Warr.
Addaea polyphoralis Wlk.

PHYCITIDAE.

Anerastria apotomella Meyr.
Ecbletodes psephenias Turn.
**Ancylosis lapsalis* Wlk.
Trissonca ianthemis Meyr.
Odontarthria subfuscella Hmps.

**Epicrocis saturatella* Mab.
Epicrocis sublignalis Wlk.
Spatulipalpia pallidicostalis Wlk.
Nephopteryx minutella Rag.
Nephopteryx metasarca Low.

GALLERIIDAE.

Heteromicta pachytera Meyr.

Galleria mellonella Lin.

CRAMBIDAE.

Neargyria argyraspis Meyr.
Crambus cuneiferellus Wlk.
Argyria amoenalis Snel.

**Ubida holomochla* Turn.
Anaclastis apicistrigella Myr.
Talis bivittella Don.

SCHOENOBIADAE.

Cirrhochrista puncticulata Hmps.

PYRALIDAE.

Endotricha dispersgens Luc.
Endotricha mesenterialis Wlk.
Endotricha docilis Wlk.
Endotricha pyrosalis Gn.
Scenedra decoratalis Wlk.
Trichophysetis cretacea Butl.

Curena externalis Wlk.
Herculia albidalis Wlk.
Bostra disticha Turn.
Spectatrotia fimbrialis Warr.
Cardamyla didymalis Wlk.
Heterobela triglochis Turn.

PYRAUSTIDAE.

- Nymphula dicentra* Meyr.
Nymphula turbata Butl.
Nymphula nitens Butl.
**Cataclysta foederalis* Gn.
**Cataclysta repititalis* Warr.
Araeomorpha atmota Turn.
**Aulacodes siennata* Warr.
Musotima suffusalis Hmps.
Musotima ochropteralis Gn.
Ereta ornatalis Dup.
Hymenia fascialis Cram.
Nacoleia parasephis Meyr.
Nacoleia chrysorycta Meyr.
Nacoleia amphidecalis Wlk.
Bradina mannalis Wlk.
**Bradina admixtalis* Wlk.
Tatobotys janapalis Wlk.
Sylepta quaternalis Zel.
**Sylepta nigrilinealis* Wlk.
Sylepta adipalis Led.
Sylepta pompalis Wlk.
Sylepta derogata Fab.
Nausinoe pueritia Cram.
Phacellura indica Saund.
Hedylepta diemenalis Gn.
Hedylepta poeonalis Wlk.

- Euclasta maceratalis* Led.
Dysallacta negatalis Wlk.
Margaronia incurvata Warr.
**Margaronia pulverulentalis* Hmps.
Margaronia excelsalis Wlk.
Marasmia venialis Wlk.
Sceliodes cordalis Dbld.
**Archeris metriodes* Turn.
**Entephria cribata* Fab.
Bocchoris onychinalis Gn.
Prooedema inscissalis Wlk.
Prophantis octoguttalis Feld.
Maruca testulalis Geyer.
Acharana licarsisalis Wlk.
Crocidolomia binotalis Gn.
Sameodes cancellalis Zel.
Hyalobathra archeleuca Meyr.
Ischnurges illustralis Led.
Polygrammodes lucalis Wlk.
**Noorda amethystina* Swin.
Noorda nyctiphaes Turn.
Metasia strangalota Meyr.
Metasia acharis Meyr.
Metasia microchrysalis Wlk.
Heliothela ophideres Wlk.

TINEODIDAE.

- Palaeodes samealis* Hmps.

PTEROPHORIDAE.

- Trichoptilus adelphodes* Meyr.

- Sphenarches caffer* Zel.

ORNEODIDAE.

- Orneodes phricodes* Meyr.

TORTRICIDAE.

- Isochorista eudrosa* Turn.
Acroceuthes metaxanthana Wlk.
Capua vacuana Wlk.
Cacoecia australana Lewin.

- Colocyttara asperana* Wlk.
Colocyttara epidesma Low.
Colocyttara phaeolopha Turn.

EUCOSMIDAE.

- Spilonota semicanella* Wlk.
Eucosma plebeiana Zel.
Bactra testudinea Turn.
Polychrosis botrana Schiff.
Articollia prospera Meyr.
Argyroploce illepidia Butl.

- Argyroploce amoebaea* Low.
Argyroploce miltographa Meyr.
Argyroploce doxicastana Meyr.
**Argyroploce exedra* Turn.
Laspeyresia aurantiana Pryer.

ELACHISTIDAE.

- Cosmopteryx mimetis* Meyr.
Zapyrastra calliphana Meyr.
Labdia deliciosella Wlk.
Labdia chryselectra Meyr.
Labdia cyanogramma Meyr.

- Pyroderces aulacosema* Low.
Pyroderces mesoptila Meyr.
Pyroderces terminella Wlk.
Otonoma anemois Meyr.

GELECHIADAE.

- Aristotelia furtiva* Meyr.
Aristotelia thetica Meyr.
Anacampsis simplicella Wlk.
Acanthophila xanthastis Low.
Platyedra gossypiella Saund.
**Anaptilora isocosma* Meyr.
Anaptilora eremias Meyr.
- Crocantbes prasinopis* Meyr.
Crocantbes micradelpha Low.
Achoria inopina Meyr.
Lecithocera micromela Low.
Dichomeris thanatopsis Low.
Tituacia deviella Wlk.

XYLORYCTIDAE.

- Cryptophasa themerodes* Turn.
Plectophila thrasykosma Meyr.
Odites pudica Low.
- Catoryctis eugramma* Meyr.
Procometis hylonoma Meyr.

OECOPHORIDAE.

- Macrobathra mesopora* Meyr.
Barea leucocephala Turn.
Oenochroa laetella Wlk.
Epipyrga agaclita Meyr.
Scaeosopha mitescens Luc.
Eulechria tropica Meyr.
Eulechria threnodes Turn.
Eulechria xipheres Turn.
Eulechria amaura Meyr.
Eulechria triferella Wlk.
Eulechria melanogramma Turn.
Machimia pudica Zel.
Machimia sobriella Wlk.
Machimia costimacula Meyr.
Machimia sarcodes Turn.
Machaeritis melanospora Meyr.
Machaeritis samphoras Meyr.
Machaeritis heniocha Meyr.
- Ocystola neurota* Meyr.
Coesyra translata Wlk.
Coesyra cyclotoma Meyr.
Coesyra distincta Turn.
Coesyra leptospila Meyr.
Enchironista proximella Wlk.
Philobota cosmocrates Meyr.
Chrysonoma fascialis Fab.
Zonopetala divisella Wlk.
Eochrois laetiferana Wlk.
Eochrois protophaes Meyr.
Tortricopsis pyroptis Meyr.
Eutorna pabulicola Meyr.
Leptosaces schistopa Meyr.
Scorpiopsis pyrobola Meyr.
Peritorneuta circulatella Wlk.
Peritorneuta thyellia Meyr.

HELIODINIDAE.

- Aeoloscelis hydrographa* Meyr.
Vanicela xenadelpha Meyr.
- *Stathmopoda mimantha* Meyr.
Stathmopoda crocophanes Meyr.

GLYPHIPTERYGIDAE.

- *Brenthia quadriforella* Zel.
- *Simaethis ophiosema* Low.

HYPONOMEUTIDAE.

- Tanaoctena oöptila* Turn.
Hyponomeuta paurodes Meyr.
Hyponomeuta myriosemus Turn.
- Lactura cristata* Butl.
Lactura pilcheri Luc.

GRACILARIADAE.

- Epicephala albistriatella* Turn.

PLUTELLIDAE.

- Tonza purella* Wlk.

TINEIDAE.

- Bucculatrix ulocarena* Turn.
Erechthias caustophara Turn.
Iphierga stasiodes Meyr.
Moerarchis australasiella Don.
- Scardia clonodes* Meyr.
Monopis meliorella Wlk.
Tinea xyetidophora Meyr.

COSSIDAE.

- Xyleutes duponcheli* Newm.

HAPIALIDAE.

- Charagia cyanochlora* Low.

Our record comprises 407 species, of which 57 are Rhopalocera. This is of course only a small fraction of what would be obtained by continuous collecting in what is certainly a rich locality. It gives only the species obtainable at one season of the year, and these very incompletely. But it may claim to be a fairly representative list, very few families are not represented, and some are represented to a considerable extent. Before discussing what conclusions may be drawn from it, let us first state the problem that we were endeavouring to solve. We wished to know whether the coastal district of Central Queensland had any peculiar endemic fauna. So far as the species attached to the forest areas are concerned this was scarcely possible, for the forest presents an unbroken area throughout the Queensland coast. The case is different with the species attached to the jungle. It is a perfectly accurate statement, that the Queensland coastal district consists of a sea of Australian forest dotted with islands of Indo-Malayan jungle, and whether the jungle presented a gradual transition in its fauna from south to north was an open question. We also wished to establish the relationship of what we may call the Yeppoon fauna to the Brisbane and Cairns faunas. To the first question we can give an unequivocal answer. The number of unidentified species (not represented in our list) was comparatively small, and with only two or three exceptions they belong to those sections of our fauna that are at present most imperfectly known, the NOCTUINAE and HYPENINAE sections of the NOCTUIDAE, the PHYCITIDAE, and the various families of the TINEOIDEA. The Yeppoon fauna is not peculiar, but consists of a mixture of the Brisbane and Cairns faunas. The presence of the latter was very evident; a large number of species, which I have marked with a * find in Yeppoon their most southern record. Many of these species were both conspicuous and abundant. Yeppoon is probably the limit of the range of many of them, though we must acknowledge that stragglers at any rate may yet be found further south, and that we know hardly anything of the Lepidoptera between Yeppoon and Gympie, a distance of 300 miles, including the Bundaberg district. An instance in point was the large and handsome *Cupha prosopae*, which we found abundant everywhere, while in Brisbane it is a rare visitor. Many species also find in Yeppoon their most northern record, but in this instance it is much less probable that it is their real northern limit. Though our knowledge of the districts to the north is fragmentary, there are indications that the Brisbane fauna extends much further north, to the Eungella Plateau behind Macleay, and to the highlands around Herberton. Our conclusion that the jungle fauna of the Queensland coast contains no endemic areas applies to low altitudes only. The mountain jungles above 2,000 ft. may not conform to this, but here we have no sufficient data from which to draw any conclusion.

Among the Rhopalocera we took only a small proportion of the LYCAENIDAE and HESPERIDAE that must be found in the locality; in the other families there are not so many gaps to be filled. The GEOMETRIDES are poorly represented, least so in the STERRHIDAE. Of the NOCTUIDAE the list is comparatively large. The same is true of the PYRAUSTIDAE, a characteristically tropical group. Next to these are the OECOPHORIDAE, and it is noteworthy that all of this family that have been identified occur further south. Of the other families the GELECHIDAE were best represented. Probably the TORTRICITES would be found much better represented in the autumn.

AUSTRALIAN TICKS.

By E. W. FERGUSON, M.B., Ch.M.

The attention of the public has recently been directed to two aspects of the tick problem—the poisonous effects of the scrub tick in human beings, and the outbreak of tick fever in cattle in the Tweed River district.

It would seem advantageous, therefore, to briefly review the present state of knowledge of our Australian ticks, including all the described species, as well as those of known noxious habits.

Ticks belong to the class ARACHNIDA, which includes the spiders and scorpions, and to the order ACARINA, which comprises both mites and ticks. With the mites—many of which are of interest, both from the medical and economic aspects—I do not propose to deal in this article.

The classification of the ticks has been the subject of much discussion, which will be found in Nuttall, Warburton, Cooper, and Robinson: "Ticks, a Monograph of the *Ixodoidea*," Part II., 1911. The arrangement there suggested is followed in what appears below. According to these authorities the ticks are included in the super-family IXODOIDEA Banks, which is further subdivided into the families ARGASIDAE and IXODIDAE.

In the ARGASIDAE the whole body is covered by a more or less uniform leathery integument, whereas the IXODIDAE possess a shield or scutum which covers the whole back in the male but only forms a small patch on the anterior part of the dorsum of the female. In the ARGASIDAE the capitulum—which includes the "biting" apparatus—is ventral in position, and may be completely concealed from above; in the IXODIDAE it is anterior and visible in its entirety. There are other differences between the two families which need not be further enumerated here.

Life History.—The tick passes through four separate stages in its life history—egg, larva, nymph, and adult. The larvae possess only three pairs of legs, and the nymph may be distinguished from the adult by the absence of the genital pore. Beyond this general scheme the life histories of different species vary greatly, particularly in regard to the relationship of the species to their hosts.

Too little is known in this respect of the life histories of Australian ticks, and, with one exception, the life history has not been fully worked out of a single native species.

Several different types of life histories are known among ticks. Thus in some species (*e.g.*, *Boophilus australis*) all the stages are passed on the one animal, the female only dropping off when replete. In other cases (*eg.*, *Ixodes*) each stage, when replete, drops from the host, ecdysis taking place on the ground. In still other cases the larval and nymphal stages may be passed on the one individual, the nymph dropping off when replete.

In some instances ticks appear to attack numerous animals indiscriminately; in other cases they are more or less rigidly restricted to a species or group of closely related species of animals; or the larva, or larva and nymph, may be

confined to one species and the other stages to another, or may attack other animals indiscriminately.

ARGASIDAE.—Two genera (*Argas* and *Ornithodoros*) are admitted by Nuttall, Warburton, Cooper, and Robinson (1908), though these authors state that the differences between the two are less obvious than was formerly considered the case, intermediate species having been found that tend to bridge the gap between the type species of the two genera (*loc. cit.*, p. 3). The chief distinction lies in the lateral margin of the dorsum, which in *Argas* is distinctly flattened with a structure different from the general integument, this margin giving the body a sharp edge which is never completely obliterated even when the tick is replete; in *Ornithodoros* the margins are thick and ill-defined, not differing in structure from the rest of the integument and disappearing on distension. The capitulum is ventral in *Argas* and quite invisible from above; in *Ornithodoros* it is subterminal and the anterior portions often visible dorsally in the adult.

Both genera contains species which are of great economic importance, being carriers of spirochaetes, which are the casual organisms of disease in human beings and animals. Thus *Spirochaeta marchouxi*, the cause of spirochaetosis in fowls, may be transmitted by *Argas persicus*, *A. reflexus*, and *Ornithodoros moubata*. *Spirochaeta duttoni*, the causal organism of West African relapsing fever, is conveyed by *Ornithodoros moubata*, and it is now generally considered that relapsing fever in Persia and other parts of Western Asia is carried by *Argas persicus*.

Argas persicus (Oken), 1818.—This cosmopolitan species has been introduced into Australia, and is now well established, probably in all the States. It is a denizen—in this country, at any rate—of fowl houses and coops, and is commonly termed the fowl tick.

As the vector of the causal organism of fowl spirochaetosis, this species is of considerable economic importance. A full account of the life history will be found in Nuttall, Warburton, Cooper, and Robinson (1908). The eggs are laid in the hiding places of the adults, in cracks and crevices in the walls (*op. cit.*, p. 81). Hatching takes place in about three weeks. The larvae drop off the fowl after feeding, and by moulting change to the nymphal stage, after which the nymphs attach themselves to a fresh host. Two moults take place in the nymphal stage, the adult tick emerging after the second moult.

A second species (*Argas reflexus* Fabr.) is included by Rainbow in his "Synopsis of Australian *Acarina*" (1906). The geographical distribution, according to Nuttall and Warburton, is Europe and Northern Africa. As the species is a common parasite of the pigeon, it might easily be introduced.

Argas vespertilionis (Latr., 1796).—The bat tick is recorded by Taylor (1913, p. 73) from Townsville.

Argas lagenoplastis Froggatt, 1906, was described by Froggatt from the nests of the fairy martin or bottle swallow, *Lagenoplastes ariel*.—I have obtained this tick from the nests of the same bird at Rooty Hill, near Sydney. It is of interest, as being the only native species of the genus.

Ornithodoros talaje (Guerin, 1849).—This species is the only member of the genus recorded from Australia. It has a wide distribution, and frequents native houses, attacking man. A variety or distinct species (*capensis*) has been described which was found in penguin nests off the coast of South Africa. A specimen of this species was taken by Dr. J. B. Cleland from the little penguin (*Eudyptula minor*) in Western Australia. At least one other undescribed species of *Ornithodoros* occurs in Australia.

IXODIDAE.—Various attempts have been made to split up the IXODIDAE into separate tribes. It is not necessary here to discuss the question, and the ar-

rangement of genera given by Nuttall and Warburton (1911) has been followed. These authorities divide the Ixodidae into two sections.

I. *Prostriata*; with anal grooves surrounding the anus in front. Genus *Ixodes*.

II. *Metastriata*; with anal grooves surrounding the anus behind. Genera: *Haemaphysalis*, *Dermacentor*, *Rhipicentor*, *Rhipicephalus*, *Margaropus*, *Boophilus*, *Hyalomma*, *Amblyomma*, *Aponomma*.

Aponomma is regarded by Nuttall and Warburton as only a sub-genus of *Amblyomma*, while *Boophilus* is regarded by many as a sub-genus of *Margaropus*.

The genera may be separated by the following key, which is extracted from the characters given by Nuttall and Warburton for the different genera.

{	With anal grooves contouring the anus in front	<i>Ixodes</i> .
	(<i>Prostriata</i>)	
{	With anal grooves contouring the anus behind	1
	(<i>Metastriata</i>)	
1 {	Capitulum short (<i>Brevirostrata</i>)	2
	Capitulum long (<i>Longirostrata</i>)	7
2 {	Festoons present; anal grooves well marked . . .	3
	Festoons absent; anal grooves obsolete	6
3 {	Eyes absent	<i>Haemaphysalis</i> .
	Eyes present	
4 {	Basis capituli rectangular dorsally; no ventral	<i>Dermacentor</i> .
	plates or shields	
5 {	Basis capituli hexagonal	5
	No ventral shields in the ♂	<i>Rhipicentor</i> .
6 {	Adanal shields present in the ♂	<i>Rhipicephalus</i> .
	♂ with median ventral plate	<i>Margaropus</i> .
7 {	♂ with adanal and accessory adanal plates . . .	<i>Boophilus</i> .
	♂ with adanal shields	<i>Hyalomma</i> .
8 {	♂ without adanal shields, sometimes with small	8
	plaques near festoons	
8 {	Eyes present	<i>Amblyomma</i> .
	Eyes absent	<i>Aponomma</i> .

IXODES.

This genus is well represented in Australia by some eleven species, including the common bush tick (*Ixodes holocyclus*). The following keys comprise the Australian species, and are extracted from Nuttall and Warburton's keys to the genus.

Males.

{	Body with five posterior brushes of hairs . . .	<i>I. putus</i> .
	Body without such hairs	1
1 {	Legs inordinately long	<i>I. vespertilionis</i> .
	Legs moderately long	2
2 {	Anal grooves closed behind	<i>I. holocyclus</i> .
	Anal grooves open behind	<i>I. tasmani</i> .

Females.

{	Legs inordinately long (on bats)	<i>I. vespertilionis</i> .
	Legs moderate	1
1 {	Anal grooves convergent or closed behind . . .	2
	Anal grooves subparallel or divergent	4
2 {	With article 1 much enlarged	3
	Palps normal	<i>I. holocyclus</i> .

3	{	Scutum broader than long; anal grooves closed behind	<i>I. australiensis.</i>
		Scutum as broad as long; anal grooves convergent, but open behind, at least in replete females	<i>I. victoriensis.</i>
4	{	Coxæ practically unarmed	5
		Some of the coxæ with distinct spurs	9
5	{	Scutum broadest quite in front (on marine birds)	<i>I. putus.</i>
		" " near middle or posteriorly	6
6	{	Scutum broadest behind the middle	7
		" " near middle or a little anteriorly	<i>I. vestitus.</i>
7	{	Scutum broader than long	8
		" longer than broad	<i>I. fecialis.</i>
8	{	Palps with article 1 greatly enlarged on ventral aspect	<i>I. tasmani.</i>
		Palps with article 1 small	<i>I. ornithorhynchi.</i>
9	{	Spurs present on trochanters	<i>I. percavatus.</i>
		No spurs on trochanters	<i>I. eudyptidis.</i>

Ixodes holocyclus Neumann, 1899.—This well-known species, commonly called the bush tick or bottle tick, is widespread along the coastal region of Eastern Australia. The exact distribution has not yet been worked out. It is common around Sydney, but it does not appear to have been recorded from the Blue Mountain districts, though specimens are in the departmental collection from Bunya Mountains in Queensland. Nuttall and Warburton record (1911, p. 237) the species from Western Australia, and also from India. The tick so prevalent in Northern Queensland probably belongs to this species, though no specimens are to hand. Taylor (1913, p. 71), however, records it from Cairns district. The question of distribution is of some importance, since it is probable that this species exerts a controlling influence on the establishment of the introduced fox in the coastal districts. It has been found on a large number of hosts, including marsupials (*Macropus* spp., *Phascogale*, *Perameles*), rodents (*R. rattus*), dogs, man and birds (*Pitta*, duck).

As an account of the life history of this species has been published recently by Mr. Clunies Ross, of the Veterinary School, University of Sydney, it is not proposed to enter fully into the subject here. It may be stated, however, that the three stages are passed on different hosts, the tick dropping to the ground after each stage. The so-called seed ticks, which occasionally attack human beings in large numbers (over 200 have been taken off a single individual), are the larval form.

The chief interest in the species lies in the toxic effects produced in man and dogs. As in the case of *Dermacentor venustus*, in British Columbia, it seems probable that the symptoms produced by this tick are due to a toxin elaborated by the tick, rather than to a specific organism introduced through the wound. This point is, however, still unsettled, though it is significant that repeated search of the blood and other tissues in affected dogs has, so far, failed to reveal any evidence of the presence of a parasite. In dogs the principal symptom is an ascending paralysis, affecting first the hinder extremities, so that the dog appears to drag the hind quarters. If the condition be recognised early, and the tick be found and removed, recovery may take place; otherwise it ends fatally, probably by paralysis of the muscles of respiration. The work of Dr. Sydney Dodd (1921) first firmly established that these cases of paralysis in dogs were due to *Ixodes holocyclus*, though, from practical experience, this species had been

incriminated as the cause for many years.

In human beings the symptoms are less definite in their course, and the records in the past have not been too satisfactory, and characterised generally by lack of authentic identification of the species.

Several fatal cases due to ticks have occurred in children, in one of which the species was authentically identified.

Ixodes fecialis, Warburton and Nuttall, 1909.—This species was described from a gorged female from *Dasyurus geoffroyi*, Western Australia. In the same paper a variety—*aegrifossus*—was described from an opossum (Queensland) and *Perameles obesula* (Western Australia). Later Nuttall (1916, p. 327) recorded the species from *Dasyurus viverrinus*, New South Wales, and also condemned the variety *aegrifossus* (p. 335), as intermediate forms were found between the type and the supposed variety.

Specimens in the departmental collection are from *D. viverrinus* and *Rattus rattus* (Sydney). The male is unknown.

Ixodes ornithorhynchi, Lucas, 1845.—Originally recorded from Tasmania, this species has been recorded by Nuttall (1916, p. 329), also from Western Australia and Victoria; in all cases specimens were taken on the platypus (*Ornithorhynchus anatinus*). In view of the apparent restriction of the species to this host, the record of *I. ornithorhynchi* from Marianne Islands (Nuttall and Warburton, 1911, p. 242) must be viewed with suspicion. The male is unknown.

Ixodes tasmani, Neumann, 1899.—Described from (a) specimens collected by Verreaux (1847) in Tasmania; (b) specimens from the Island of St. Pierre (Ponafidin ?); and (c) an unknown locality, the hosts being unknown.

Nuttall (1916, pp. 321-4) has redescribed the species and described the male, specimens being from *Trichosurus vulpecula*, Queensland, and *Dasyurus maculatus*, *Petauroides volans*, *Trichosurus vulpecula*, and *Phascolarctus cinereus* Victoria. Specimens in the departmental collection from an opossum (Eidsvold. Queensland), appear to belong to this species.

Ixodes vestitus, Neumann, 1908.—Described from Western Australia from *Myrmecobius fasciatus*; also recorded from a snake (*Diemenia superciliosa*). The characteristic clothing of stiff hairs should make this species easily recognisable. The male is unknown.

Ixodes australiensis, Neumann, 1904.—Described from Western Australia as occurring on *Canis familiaris*; also recorded as occurring on *Bettongia lesueuri*. The species has the first palpal joint much enlarged, as is the case in the next species.

Ixodes victoriensis, Nuttall, 1916.—Described from two gorged ♀ from a wombat (doubtless *Phascalomys mitchelli*), Victoria. The species is allied to *I. australiensis* (Neumann), but differs therefrom, especially in the structure of the capitulum, scutum and tarsi.

Ixodes putus (Pickard-Cambridge, 1878).—"This species has a remarkably wide geographical distribution. As yet it has only been found parasitic on marine birds or infesting their breeding places, where it occasionally attacks man" (Nuttall and Warburton, 1911, p. 260). Among the records occurs King Island (Tasmania ?). This species is, however, recorded by Nuttall (1916, pp. 330-1) as occurring commonly on various species of penguins and the sooty albatross on Macquarie Island.

Ixodes percavatus Neumann, 1906.—Recorded by Nuttall (1916, p. 329) from Perth, Western Australia from a ♀ taken by Prof. J. B. Cleland on a penguin (*Eudyptula minor*). In forwarding this specimen Prof. Cleland noted that

the specimen had been identified as *I. eudyptidis* by Neumann.

Ixodes eudyptidis Maskell, 1885.—This species, referred by Nuttall and Warburton (1911, p. 284) to their list of doubtful species, has been resuscitated by Nuttall (1916, p. 320), who has examined a co-type of *I. eudyptidis*, Maskell. This author has determined it as the species so identified by Neumann (1899, p. 128) and later described by Nuttall and Warburton (1, c.p. 217) as *I. neumanni*. Neumann himself degraded two other names—*I. praecoxalis*, Neumann, 1899, and *I. intermedius*, Neumann, 1899—to the rank of synonyms of *I. eudyptidis*, Maskell.

The species was originally described from New Zealand, but Nuttall (1916, p. 327) records it from *Eudyptula minor* from various places off the New South Wales coast and from Flinders Island, Bass Strait. Specimens from *Eudyptula minor* from Western Australia were identified by Neumann as this species, but one at least of these has been referred by Nuttall to *Ixodes percavatus*, Neumann (*vide supra*).

Ixodes vespertilionis Koch, 1844.—This world-wide species is recorded by Nuttall and Warburton (1911, p. 277) from *Vesperugo tricolor*, South Australia. The species is limited to bats.

Two other species of *Ixodes* found on marine birds may be found to occur in Australia—*I. auritulus*, Neumann, 1904, recorded by Nuttall (1916, p. 315) from *Aptenodytes patagonica* and *Megalestris antarctica*, Macquarie Island, and *I. unicavatus*, Neumann, 1908, recorded by Nuttall (1916, p. 334) from *Diomedea exulans*, Antipodes Island.

HAEMAPHYSALIS.

The following keys to the Australian species are extracted from the keys of the genus given by Nuttall and Warburton (*loc. cit.*, p. 353):—

Males.

- | | |
|---|---|
| { Coxal spurs normal and inconspicuous | |
| { One or more coxae strongly spurred (only coxa | |
| IV. with a long spur, palpal article 2 with | |
| ventral spur) | |
| | <i>H. spinigera</i> var. <i>novae-guineae</i> . |
| { Palpal article 3 with dorsal spur, more or less | |
| 1 { erect | <i>H. bispinosa</i> . |
| " " with no such spur | 2 |
| { Scutum with surface irregular, very coarsely | |
| 2 { punctate | <i>H. papuana</i> . |
| " otherwise | 3 |
| { Scutum markedly elongate | |
| 3 { " short-oval | 4 |
| { Each palp long and narrow | |
| 4 { " conical, article 2 being broad basally . | <i>H. bancrofti</i> . |
| | <i>H. humerosa</i> . |
| | <i>H. leachi</i> . |

Females.

- | | |
|---|-----------------------|
| { Palpal article 3 with distinct dorsal spine, more | |
| or less erect | |
| { Palpal article 3 without dorsal spine, but pos- | |
| terior border may protrude | |
| | 1 |
| { Scutum much longer than broad | |
| 1 { " only slightly or not longer than broad .. | 3 |
| { Palp much longer than broad | |
| 2 { " short-cone shaped, as broad as long . . . | <i>H. humerosa</i> . |
| { Palpal article 3 with distinct ventral spur . . . | |
| 3 { " " with no spur, or at most a | <i>H. leachi</i> . |
| " slight point | <i>H. papuana</i> . |
| | <i>H. bancrofti</i> . |

Of the species recorded from Australia, two—*H. bispinosa* and *H. leachi*—are probably introduced and possibly, as Nuttall and Warburton suggest, with Indian cattle. Excluding these two species, these authors allow two species for Australia, but have apparently overlooked their own record of *H. spinigera* var. *novae guineae* from Australia. The Australian record of *H. papuana* is possibly erroneous, but the species is included in the table on the strength of Tryon's records, and since it occurs in New Guinea there is no reason why it should not be found to occur in Australia. *H. longicornis* (Neumann, 1901) is not included in the table, being regarded by Nuttall and Warburton as a doubtful species.

Haemaphysalis leachi (Audouin, 1827).—Neumann recorded this species from New South Wales, the specimens from a horse having been sent by the Agricultural Department. Froggatt (1900, p. 542) states that the specimens were taken on horses and cattle at Grafton and Wallangarra. Neumann (1905, p. 258) erected a variety *australis* for the Australian specimens, and later (1911, p. 115) made the variety into a sub-species. Nuttall and Warburton (1915, p. 467), however, do not regard the supposed differences as more than variations which may occur in a series from other localities. This species is widely distributed in Africa and Southern Asia, and has doubtless been introduced into Australia. An account of the life history is given in Nuttall and Warburton (1915, pp. 536-542). The species requires three hosts upon which to feed during its larval, nymphal and adult stages. The larva and nymph remain attached to the host for three to seven days, and the females from eight to sixteen days. The males may remain on the host for many weeks.

H. leachi is the carrier in Africa of canine piroplasmosis, a very fatal disease in dogs. The organism is imbibed by females when sucking the blood of an infected animal; it then undergoes development in the tick and penetrates the eggs. The larvae and nymphs, though infected, are not capable of transmitting the disease, but the adults are, and may remain so after fasting for several months.

Taylor records the species from Ching Do, Northern Queensland, taken on *Macropus agilis*.

Haemaphysalis bispinosa Neumann, 1897.—This species has a widespread distribution in India, Burma, Malay States, China, Japan and Borneo, and has been recorded from East Africa. It is not uncommon in the north coastal districts of New South Wales, and specimens from horse (Ballina) and calf (Bonville) sent from this laboratory are recorded by Nuttall and Warburton. The species has also been introduced into New Zealand, where it is now the common cattle tick. An account of its life history will be found in an article "The Cattle Tick (*Haemaphysalis bispinosa*)" by J. G. Myers, in the *New Zealand Journal of Agriculture*, XXVII, p. 67, 1923. The species is a "three-host" tick, cattle being the chief hosts, but other animals, including some of the introduced small birds, are infected. The winter is passed as a nymph hidden at the base of rushes and clumps of rough grass.

Haemaphysalis bancrofti Nuttall and Warburton, 1915.—These authors record this tick from *Macropus giganteus* and *M. dorsalis* from the Burnett River district, and from *Bettongia penicillata*, also from Queensland. Specimens in the departmental collection from Eidsvold (Burnett River district), taken off a rock wallaby (*Macropus* sp.), are apparently referable to the same species. All stages—larva, nymph, adult (♀)—are known, but the life history has yet to be worked out, and also whether the species is responsible for the transmission of any parasites.

Haemaphysalis humerosa, Warburton and Nuttall, 1909.—This species has

apparently a wide distribution in Australia, originally described from *Parameles macrura*, Barrow Island, North-west Australia. It has been recorded from the Northern Territory from the same host; and from Sydney off *Perameles nasuta*. Nymphs, and adults (♂) are known.

Haemaphysalis spinigera var. *novae-guineae* (Hirst, 1914).—Originally described as a distinct species, Nuttall and Warburton (1915, p. 449) have degraded *novae-guineae* to a variety of the Asian *H. spinigera* (Neumann, 1897). It was described from marsupials from German New Guinea, but Nuttall and Warburton also record it from a kangaroo, Northern Territory.

Haemaphysalis papuana Thorell, 1882.—Canestrini (1884, p. 705) determined a tick from Queensland as this species. Nuttall and Warburton (1915, p. 404) state that his determination is probably wrong, or else the figure he gave is incorrect. The species is recorded by Tryon (1917-1919) from Queensland, in the latter instance as infesting cattle.

Haemaphysalis longicornis Neumann, 1901.—A doubtful species, described originally from two ♀ found on cattle at Kempsey, New South Wales. Neumann later (1905, p. 257) degraded the species to a variety of *H. concinna* (Koch, 1844), and in 1911 (p. 111) raised it to the rank of a sub-species. Nuttall and Warburton (1915, p. 512) regard this identification as open to grave suspicion, as *H. concinna* is scarcely to be identified in the absence of the characteristic ♀. Froggatt (1900, p. 542) states that specimens were taken on cattle at Narrabri and Kempsey.

DERMACENTOR.

One species—*Dermacentor atrosignatus* Neumann, 1906, is doubtfully recorded as Australian. *Ixodes coralis*, Gervais, 1842, may possibly also belong to this genus. In the present state of knowledge it seems extremely doubtful if the genus occurs in Australia.

RHIPICEPHALUS.

Rhipicephalus sanguineus (Latreille, 1804).—The common European dog tick, this species has been recorded (6 ♂, 5 ♀) by Neumann (1897, p. 389) from a dog from Queensland. The tick is recorded by Tryon (1917-1919) as occurring in the Northern Territory and in Queensland, in the latter instance as infesting dogs. The species is of importance, as it is the vector of canine piroplasmosis (*P. canis*) in India and probably throughout Asia, Southern Europe and North Africa (Nuttall, 1913, p. 309).

This genus is often regarded as a sub-genus of *Margaropus*; one species is found in Australia.

BOOPHILUS.

Boophilus annulatus australis (Fuller, 1899).—The well-known cattle tick of Queensland is generally regarded as a variety of the Texas Fever tick (*B. annulatus*, Say, 1821), and is evidently an introduction into Australia, possibly, as suggested by Gilruth, from Batavia in 1872. It was first discovered near Darwin in 1880-81, from whence it spread into Queensland and over practically the whole of that State, except the dry inland areas. It has also established itself in northern New South Wales.

The importance of *B. annulatus australis* lies in the fact that it is the vector of *Piroplasma bovis*, the causal organism of bovine piroplasmosis, commonly known as tick fever or redwater fever; which has been the cause of serious economic loss. All stages of the tick may be found on the host at the one time as ecdysis occurs on the animal; the replete female drops off the beast to lay its eggs, which average in number about 3,000. The eggs having hatched, the larvae crawl up grass stems, vegetation, fences, etc., to await a host. Apart from

conveying infection, these ticks may cause deterioration and even death by infestation of a beast in enormous numbers—tick worry. An extensive literature has grown up on the economic aspect and should be consulted for full details as regards life history, symptoms, prevention, treatment, disinfection, etc.

HYALOMMA.

A single species of this genus has been introduced into Australia; there are no native species.

Hyalomma aegyptium (Linneus, 1758).—This species is recorded by Taylor (1913, p. 71) from dogs, Townsville, Queensland. The species was also taken by J. B. Cleland on camels in Western Australia.

AMBLYOMMA.

This genus is represented in Australia by six described species, which occur on marsupials, domestic animals, and reptiles. The following keys to the Australian species is extracted from the table in Patton and Cragg (1913, p. 612), given as after Neumann.

Males.

1	{	Scutum with marginal groove completely contouring the posterior border	<i>A. triguttatum.</i>
		Scutum with incomplete marginal groove (formed of punctations or not contouring the posterior border)	1
2	{	Scutum with marginal groove continuous	2
		Scutum with a light border, and marginal groove formed of punctations	3
3	{	Scutum with reddish yellow patches, marginal grooves commencing posterior to the eyes	<i>A. moreliae.</i>
		Scutum coloured brown, marginal grooves commencing on a level with the eyes	<i>A. australiense.</i>
4	{	Scutum with broad border interrupted, festoons with very fine punctations	<i>A. limbatum.</i>
		Scutum with uninterrupted straight border, festoons with large punctations	<i>A. albolimbatum.</i>

Females.

1	{	Coxa 1 with unequal spurs	1
		Coxa 1 with equal or subequal spurs	4
2	{	Scutum as broad as long	2
		Scutum much broader than long	<i>A. postoculatum.</i>
3	{	Porose areas with prominent borders, and as large as the eyes	<i>A. triguttatum.</i>
		Porose areas without prominent borders, smaller than the eyes	3
4	{	Scutum without spots, lateral grooves fine; and formed of punctations	<i>A. australiense.</i>
		Scutum with five light spots, without lateral grooves	<i>A. limbatum.</i>
5	{	Scutum as broad or hardly broader than long	<i>A. albolimbatum.</i>
		Scutum much broader than long	<i>A. moreliae.</i>

Amblyomma albolimbatum, Neumann, 1906.—This species occurs commonly on reptiles; specimens in the departmental collection were taken from the tiger snake, stumpy-tailed lizard (*Trachysaurus rugosus*), and "bob-tailed goanna"—the latter specimens are from Geraldton, Western Australia (J. Clark, 29th November, 1912). The original specimens were taken on *Trachysaurus rugosus*.

Amblyomma moreliae (Koch, 1867).—This species, described from the carpet snake, occurs commonly on reptiles; specimens are in the collection of the Health Department from a carpet snake, Brisbane, tiger snake and brown snake, Sydney. Taylor (1913, p. 72) records the species from the green spinifex snake, Northern Territory. Neumann recorded it from the horse and kangaroo.

Amblyomma triguttatum, Koch, 1844.—This species has been recorded from a number of hosts, including the platypus (*Ornithorhynchus*), kangaroo, horse and ox.

A gorged ♀ from the ox is in the departmental collection, also two ♀ from red kangaroo, Wagrakine, Western Australia.

Froggatt (1900, p. 541) records it from the following localities in New South Wales:—Barham (paddymelon), Dubbo (cattle), Narrabri (dogs and cattle).

Amblyomma australiense, Neumann, 1905.—Described from the echidna. Taylor (1913, p. 72) records it from Townsville from the same host.

Amblyomma limbatum, Neumann, 1899.—Described from six ♂ from King Island, and two ♀ Adelaide.

Amblyomma postoculatum, Neumann, 1899.—Also described from King Island from a single ♀ received with the ♂ of *A. limbatum*. No host is recorded for either species.

APONOMMA.

This genus is regarded by Nuttall and Warburton as a sub-genus of *Amblyomma*. It is well represented in Australia, and at least one species is of very common occurrence on lizards (*Varanus*).

Males.

{	Scutum without marginal grooves	<i>A. ecinctum</i> .
	Scutum with marginal grooves	1
1 {	Tarsi without subterminal humps	<i>A. trachysauri</i> .
	Tarsi with subterminal humps	2
2 {	Scutum with punctate marginal grooves, and with reddish spots	<i>A. decorosum</i> .
	Scutum with deep lateral grooves, brownish red without spots	<i>A. hydrosauri</i> .

Females.

{	Scutum with three metallic spots	<i>A. trimaculatum</i> .
	Scutum uniformly reddish brown, without green spots	1
1 {	Scutum heart shaped (lateral angles towards the anterior third)	<i>A. ecinctum</i> .
	Scutum triangular (lateral angles towards the anterior fourth)	2
2 {	Scutum broader than long; porose areas sub-triangular and subcontiguous	<i>A. trachysauri</i> .
	Scutum as long as broad	3
3 {	Hypostome with 6 rows of teeth; porose areas small, round, close, at a subtangent to the posterior border of basis capituli	<i>A. decorosum</i> .
	Hypostome with 8 rows of teeth; porose areas large, oval and remote from each other . . .	<i>A. hydrosauri</i> .

Aponomma decorosum (Koch, 1867).—This is much the commonest species and is to be taken practically on every specimen of "goanna" (*Varanus* spp.). The departmental collection contains specimens from *Varanus varius*, Dubbo, June; and *V. gouldi*, Cobar. Taylor (1913, p. 73) records the species from the echidna (*Tachyglossus aculeatus*), Townsville. Neumann recorded it from *V. giganteus*, Brisbane, from ? python, a snake and echidna, and also from Fiji.

Ixodes varani, Koch, is cited by Neumann as a synonym.

Aponomma trimaculatum (Lucas, 1878).—The records of this species include Sumatra and New Guinea (*Varanus leucostigma*) as well as Australia, a single ♀ is recorded by Neumann from *Bostaurus*, New South Wales. Taylor records it from *Varanus varius*, Townsville.

Aponomma hydrosauri (Denny, 1843).—Described from *Hydrosaurus* (= *Varanus*) *gouldi*, Tasmania. Neumann records it from *V. varius*, New South Wales.

A. concolor, Neumann, is given by Blanchard (1909, p. 136) as a synonym; it was recorded from the echidna, Queensland. Froggatt (1900, p. 541) states that it is the common lizard tick and records it from *V. varius*, Goulburn, and the echidna, Bombala.

Aponomma trachysauri (Lucas, 1861).—The species is doubtfully placed on the Australian list. The original specimens were taken on *Trachysaurus scaber* in the Menagerie of the Museum de Paris. *T. scaber* may be intended for *T. rugosus*, the stump-tailed lizard or shingle-back, which is the only species of *Trachysaurus*; Mr. J. R. Kinghorn, of the Australian Museum, is, however, unable to trace any use of the name *scaber* in the genus. There is also the possibility that the ticks may have become attached to the lizard while in captivity.

Aponomma ecinctum, Neumann, 1901.—Described from specimens sent from the New South Wales Department of Agriculture. Froggatt (1900, p. 542) states that the species is common on *Aulacocyclus kaupii*—a passalid beetle. Neumann also recorded it from the Philippines.

Species of Doubtful Validity or Position.

Ixodes phascolomys, MacAlister, 1871.—Described from engorged females taken from a wombat (*Phascolomys*). Nuttall and Warburton (1911, p. 287) place it among the list of condemned species with a note "a purely nominal species." The figure is that of a replete female and so generalised that it might apply to almost any species of Ixodid tick. There are before me specimens of two species of ticks taken on the wombat. One is *Ixodes holocyclus*, represented by a single ♀; the other is represented by numerous males and replete and semi-replete females of a species of *Aponomma*, which does not appear to correspond with any of the described species of that genus. Another species of tick, *Ixodes victoriensis*, was described from the wombat by Nuttall in 1916.

Ixodes coralais, Gervais, 1842.—Of this species, which is placed in their condemned list, Nuttall and Warburton (1911, p. 283) write:—"Judging from original description may be a *Dermacentor*, from New Holland." I have not seen the original description, but Neumann (1899, p. 157), who also tentatively refers it to *Dermacentor*, states that the species was taken on a skink.

List of Species with Hosts.

	Host.	State.
<i>Argasidae</i> —		
<i>Argas persicus</i>	Fowl	All States.
<i>vespertilionis</i>	Bats	Queensland.
<i>lagenoplastes</i>	<i>Lagenoplastes ariel</i> . .	N.S.W., Q.
<i>Ornithodoros talaje</i>	Penguin	West Australia.
<i>Ixodidae</i> —		
<i>Ixodes holocyclus</i>	Marsupials, dogs, sheep, rats, birds	Q., N.S.W., W.A.
<i>fecialis</i>	<i>Dasyurus</i> , <i>Perameles</i> , <i>Trichosurus</i> , <i>Rattus</i> .	West Aus., N.S.W., Q.
<i>ornithorhynchi</i>	<i>Ornithorhynchus</i>	N.S.W., Tas., Vic.
<i>tasmani</i>	<i>Trichosurus</i> , <i>Dasyurus</i> , <i>Petauroides</i> , <i>Phascolarctus</i>	Tas., Q., Vic.
<i>australiensis</i>	<i>Canis familiaris</i> , <i>Bettongia</i>	West Australia.
<i>victoriensis</i>	<i>Phascolomys</i>	Victoria.
<i>vestitus</i>	<i>Myrmecobius</i> , <i>Diemenia</i>	West Australia.
<i>putus</i>	Sea birds	King Island.
<i>eudyptidis</i>	<i>Eudyptula</i>	N.S.W., Flinders Is.
<i>percavatus</i>	<i>Eudyptula</i>	West Australia.
<i>vespertilionis</i>	<i>Vesperugo</i>	South Australia.
<i>haemaphysalis leachi</i>	Horse, cattle, <i>Macropus</i>	N.S.W., Queensland.
<i>bispinosa</i>	Horse, cattle	N.S.W.
<i>bancrofti</i>	<i>Macropus</i> spp., <i>Bettongia</i>	Queensland.
<i>humerosa</i>	<i>Perameles</i>	North-west Australia, N.S.W.
<i>spinigera</i> , var. <i>novae-</i> <i>guineae</i> .	<i>Macropus</i>	Queensland.
<i>papuana</i>	Cattle	Queensland.
<i>longicornis</i>	Cattle	N.S.W.
<i>Dermacentor atrosignatus</i> .		? Australian.
<i>Rhipicephalus sanguineus</i> .	Dog	Queensland, N. Ter.
<i>Boophilus annulatus</i>	Cattle	Queensland, N.S.W.,
<i>australis</i>		Nor. Ter., North- West Aus., W.A.
<i>Hyalomma aegyptium</i>	Camel, dog	West Aus., Q.
<i>Amblyomma albolimbatum</i> .	<i>Trachysaurus</i> , <i>Notechis</i>	N.S.W., West Aus.
<i>moreliae</i>	Snakes (carpet, brown, tiger, etc.), horse, and kangaroo.	Q., N.S.W., Northern Territory.
<i>triguttatum</i>	Horse, cattle, dogs, kangaroo, platypus .	N.S.W., West Aus.
<i>australiense</i>	Echidna	Queensland.
<i>limbatum</i>	Unknown	King Is., South Aus.
<i>postoculatum</i>	Unknown	King Island.
<i>Aponomma decorosum</i>	<i>Varanus</i> spp., snakes, Echidna	N.S.W., Queensland.
<i>trimaculatum</i>	<i>Varanus</i> , cattle	Q., N.S.W.
<i>hydrosauri</i>	<i>Varanus</i> , Echidna . . .	Tas., N.S.W., Q.
<i>trachysauri</i>	<i>Trachysaurus</i>	? Australian.
<i>ecinctum</i>	Beetles	
" <i>Ixodes</i> " <i>phascolomys</i>	Wombat	?
<i>cocalis</i>	Skink	?

"ORNITHOLOGIA": AN OLD TIME "POEM."

Nearly ninety-eight years ago, or to be exact, in the month of October, 1827, James Jennings, of Ladywell, Lewisham, England, completed a remarkable book entitled "Ornithologia, or The Birds: a Poem, in Two Parts; with an Introduction to their Natural History; and Copious Notes." This work was dated 1828, but a copy in the possession of Mr. Tom Iredale bears the autograph of Robert Southey and the date "Keswick, 11 December, 1827," proving that copies had issued from the press prior to the date on the title page.

The last part of the title, the "copious notes" is more than justified, as the notes comprise about eighty per cent. of the total printed matter, the "Poem" being frequently limited to two lines at the top of a page. The author's merits as a descriptive naturalist far transcended his powers as a versifier—poet he was not! He takes as his Theme the Birds—

"those Princes of Air,

Who oft warble for man, and oft lighten his care,"

and brings the Raptors, the Insessors, the Rasors, the Grallators and the Nators in concourse assembled to meet the Eagle, who has issued his imperial edict that all must appear in peaceful guise, "without malice prepense."

"Even Ravens, he said, must their croaking avoid;

Nor with screams of the Peacock would he be annoyed."

First he deals with European birds, and each species named in the jingle is classified, described briefly, and a few details of its habits are given in the notes. In the second part he presents the Foreign birds, reference being made to many of our Australian species. Some lines are here quoted:—

And many Black Swans, that of yore were so rare,

On the waters were pleas'd their dark plumes to display,

While elegant gracefulness waits on their way.

The Prince of the Waders, the huge Jabiru,

Up the dell in much haste with a long serpent flew.

The Parrots, too, came, not of Afric or Ind;

Yet loth their description the muse to rescind:

The Aterrimus, prince of the Psittacid tribe;

The scarlet-rob'd Lory its name will describe;

The Banksian, black, crested, and bold Cockatoo,

With side tail feathers ting'd of a bright crimson hue,

Midst the woods of Australia delighting to rove;

Have never been seen in an occident grove.

The Menura, the Channel-bill, the "Penguin," the "Coucail Gigantic,"

Australia's own;

The Ash-grey Cereopsis; there also well known."

Many more references to our birds might be quoted, but sufficient extracts have been given to show the comprehensive nature of Ms. Jennings's "poem." The most interesting feature of the "Notes" to Australian readers is a "Synopsis of Dr. Latham's Last Work on Birds. The Latin names of the Genera are supplied, in part, from the *Index Ornithologicus* of Dr. Latham, and the remainder from private information kindly communicated by Dr. L. from his MS. copy of a new edition of the *index* not yet published." Latham's *Index* was never published. It is interesting to note that the generic name *Anthophagus* for the Honey-eaters was proposed in this MS. Index, and it was published only in the work by Jennings. As the name was even then preoccupied it cannot stand for the group.

Mathews and Iredale published a fuller note on this interesting old work in *The Austral Avian Record*, vol. iv., 1922, 172.

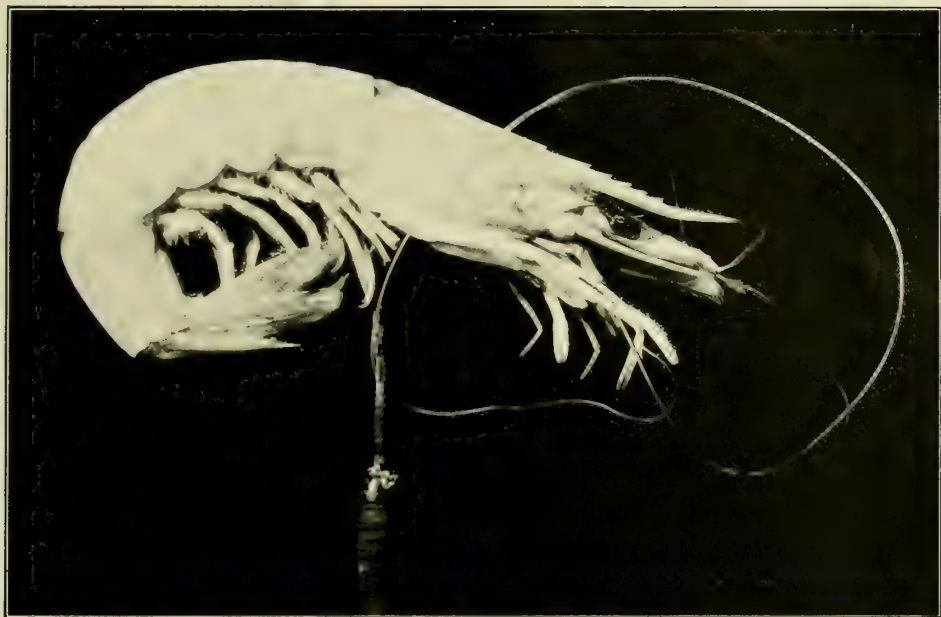


The Wedge-tailed Shearwater in its nest-burrow on Lion Island, Broken Bay, New South Wales.



The Wedge-tailed Shearwater's solitary egg on the bare ground of the nest-burrow.

Photographs by Norman Chaffer.



1. A Shrimp or Prawn found in New Zealand Waters.

Photograph by H. Hamilton.



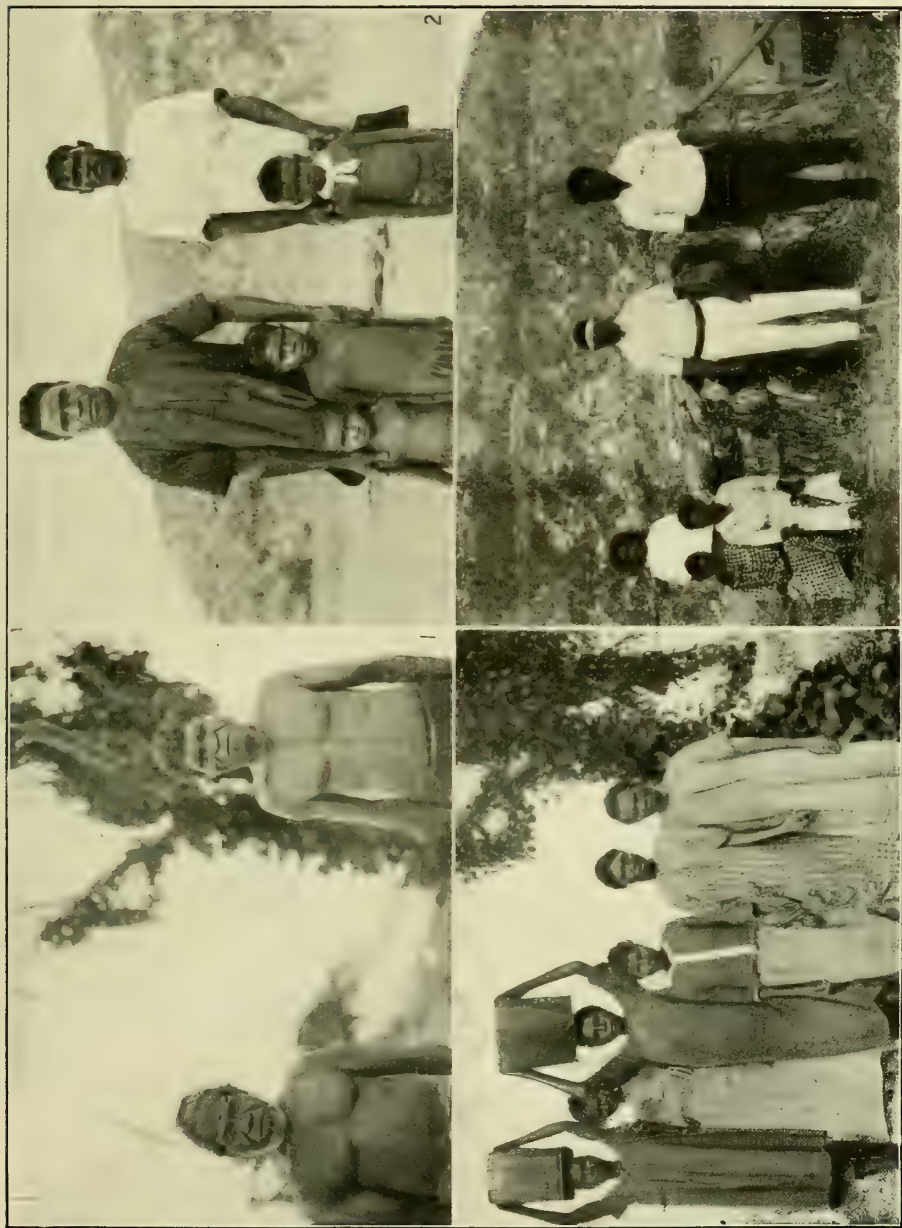
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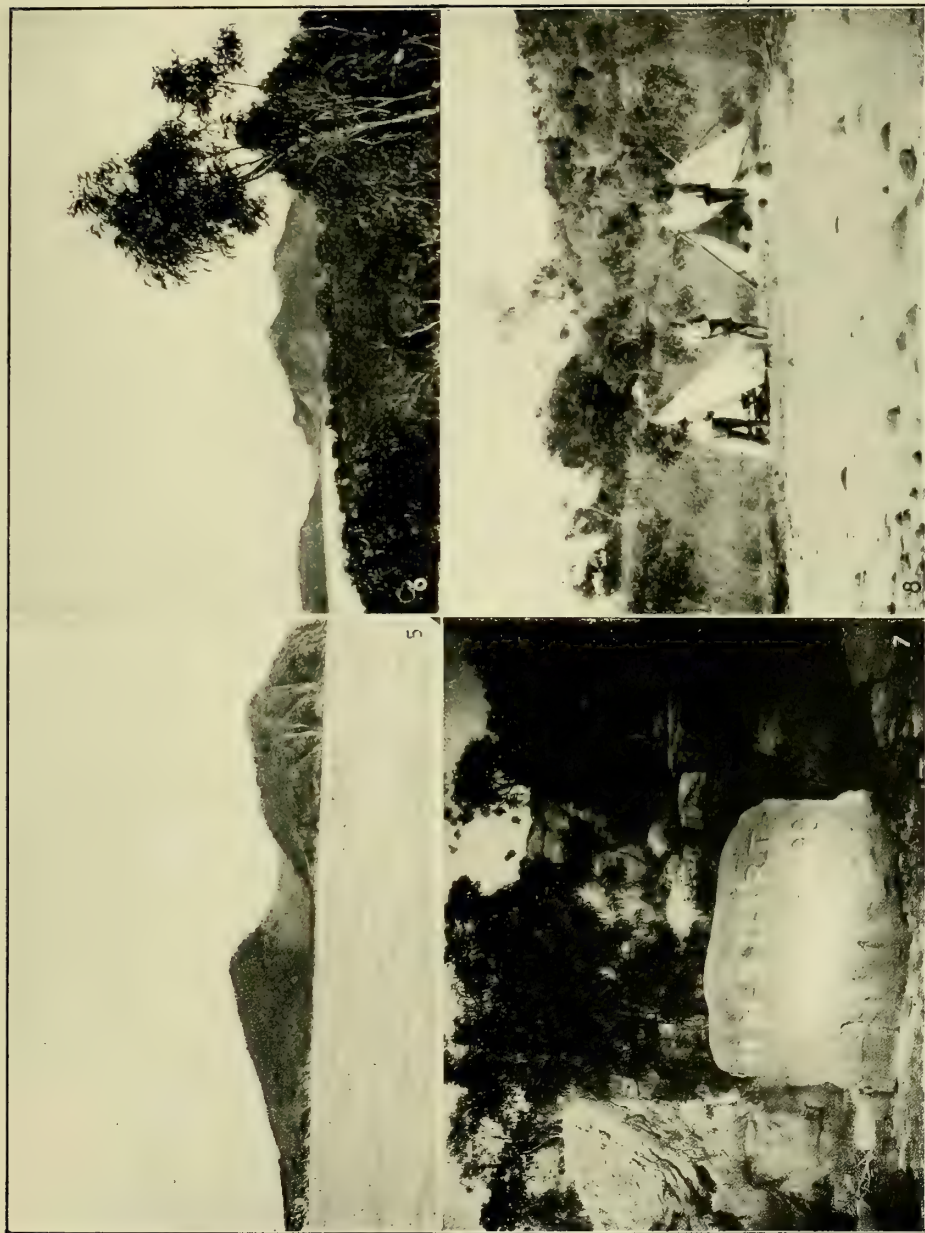
Mr. Harry Burrell testing behaviour of the Platypus under water in his specially constructed observation tank.

Cinematographed by J. S. P. Ramsay.



A NATURALIST IN NORTH QUEENSLAND.

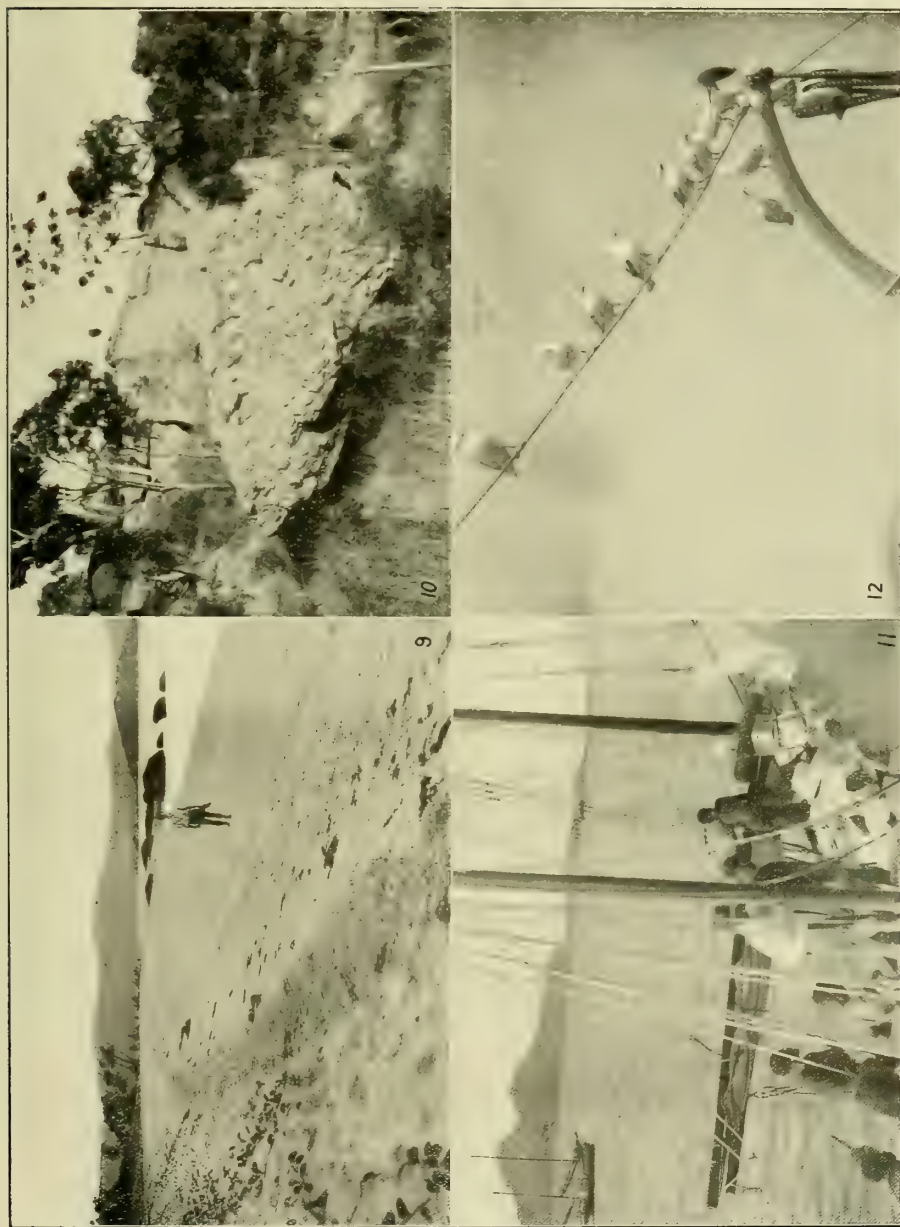
1. Whaleboat and Charlie Kunalla, the rival claimants to the throne of Flinders Island, Queensland.
 2. Willie Webb and Matti, two of the crew of the lugger "Eugowa" with their sons in full dress.
 3. Women of Flinders Island carrying water.
 4. Toby and Ropeyarn, two Flinders Islanders, at their native humpy. It is necessary to crawl to enter the "door."
- Photographs by A. F. Basset Hull.



A NATURALIST IN NORTH QUEENSLAND.

5. Saddle-back Island, Whitsunday Group, Queensland.
6. View from the top of Flinders Island, Queensland, showing Castle Peaks on Stanley Island.
7. Bench Mark of H.M.S. Dart on Flinders Island.
8. Camp on Flinders Island.

Photographs by A. F. Basset Hull.



A NATURALIST IN NORTH QUEENSLAND.

9. Beach on Armit Island, Whitsunday Group, Queensland, showing tide benches.
10. Sandstone boulder on Flinders Island.
11. Loading cargo on a beche-de-mer lugger, Flinders Island.
12. Silver Gulls perched on the rigging of s.s. Kallatua.

Photographs by A. F. Basset Hull.

Royal Zoological Society of New South Wales.

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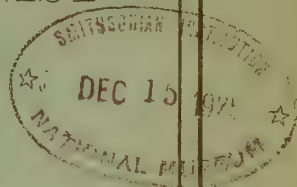
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Royal Zoological Society of New South Wales.

ANNUAL MEETING.

The Annual General Meeting was held in the Zoology Lecture Theatre, The University, Sydney, on Wednesday, 15th July. 30 members were present.

In the absence of the President, Dr. G. A. Waterhouse, through illness, the following report was read by Dr. E. W. Ferguson, Vice-President:—

Membership.

The number of members on the Register as at 30th June, 1925, was 400, 30 being life members, 252 ordinary members, 10 life associate members, 102 associate members, and 6 honorary members. The Society lost nine members by death during the year; four of these were life members, namely: Messrs. W. A. B. Greaves, J. F. Hennessey, J. Y. Mills, and R. Sands. The others were Mr. W. C. Shipway, one of the original members of the Society and a councillor and legal adviser for many years; Professor W. A. Haswell, formerly Professor Emeritus of Zoology of the Sydney University; the Hon. H. E. Kater, M.L.C.; Mr. E. M. Moors, at one time lecturer in mathematics at the Sydney University, and Mr. Max Scharff.

The Council.

Six meetings of Council were held during the year, the attendances at which were as follows:—Dr. Waterhouse, A. F. Basset Hull, E. F. Pollock, 6; J. H. Campbell, Dr. Ferguson, H. E. Finckh, A. Musgrave, D. H. Scott, D. G. Stewart, 5; Dr. O'Mbrain, A. Halloran, P. Shipway, Dr. Walkom, 4; W. W. Froggatt, Prof. Harrison, W. C. Shipway, 3; A. J. Nicholson, 2; A. R. McCulloch, 1. The two lastnamed members were on leave of absence during part of the year.

The Australian Zoologist.

During the year three parts of the journal were issued, Parts 7 and 8, completing Volume 3, in October, 1924, and January, 1925, and Part 1 of Volume 4, issued in May, 1925.

Sections.

The various sections have been active, and full reports of their doings are published in another part of the journal.

Finances.

The Society's financial position continues to improve, as will be seen from the Balance Sheet.

PRESIDENTIAL ADDRESS.

By G. A. WATERHOUSE, D.Sc., B.E., F.E.S.

To the members of the Royal Zoological Society of New South Wales, I offer my humble apologies for my absence from the chair this evening, but my health for the past few months has not been of the best, and I have been forced to cancel all my engagements for the present.

On March 21st, of this year, a very important advance was made in the activities of this Society, when the Hon. C. W. Oakes, on behalf of the chairman (F. Farnell, Esq.) and the Trustees of the National Park, handed over to this Society a stone cottage and a wooden cabin, to be used by the members of the Society as biological stations in the investigation of the fauna and flora of the National Park.

The cottage is situated at Gundamaian, Deer Park, on the Port Hacking River, is built of stone, and contains six rooms and a wide verandah, whilst adjacent are a large kitchen and outhouses. Water is laid on to the premises. The cottage overlooks the river, and is about $2\frac{1}{2}$ miles below the dam at Audley, and may be reached by launch, either from Audley or from Cronulla. A good motor road, via Audley, leads to the cottage, which is about an hour and a half by car from Sydney. The cottage is an excellent base to investigate the fauna of the surrounding forest country, and the trees growing on the river bank contain several interesting northern species. The marine fauna of the shore and the mud flats at low tide are very easy of access. A condition of the grant by the Trustees is that the cottage should be furnished and used by members of our Society to study the fauna and flora of the Park in all its aspects.

A start has been made to supply enough equipment to enable nine or ten members to camp there at one time, though, should sufficient funds become available, the cottage is large enough to accommodate up to twenty persons. The furniture and cooking utensils have been purchased from a grant of fifty pounds from the funds of the Society, supplemented by a few substantial donations from its members.

Already a considerable amount of preliminary investigation has been carried out in the vicinity of the cottage, which is in the charge of the Biological Survey Section of this Society, and the responsible officers are Professor L. Harrison, chairman, and Dr. I. Mackerras, honorary secretary. This section proposes to study the general zoology, both terrestrial and marine, to pay special attention to the insects and their ecological conditions, and also as a means to this end, the geology, physiography and flora of the region. A contour map of this area has been prepared, the types of country studied, and the flora to a certain extent listed. The physiography, geology and flora are the necessary initial steps in conducting a biological survey. A large collection of insects, including a few species new to science, has already been made, and some excellent photographs obtained of them in their natural surroundings.

Deer Park has suffered very little alteration by the presence of man, and no doubt is at the present time in much the same condition as was Sydney Cove when Captain Phillip first landed there in 1788 and founded the City of Sydney. The study of this portion of the Park will enable us to know to a great extent what was the original fauna and flora of Sydney itself.

The cabin, on the other hand, is situated near the southern boundary of the Park, slightly north of the road from Waterfall Railway Station to the Upper Causeway, and also very close to the Port Hacking River. It is a substantial wooden structure of two rooms and a verandah; a large tank for the supply

of water has also been provided. It is in charge of the Ornithological Section of the Society, with Mr. A. H. Chisholm as its present chairman, and Mr. Neville Cayley as honorary secretary. The furniture and utensils necessary to provide for camping have been provided by a grant from the funds of the Society, with the addition of a few subscriptions from members.

Beside the better forest growth in the neighbourhood, there is a larger area of brush country, than that surrounding the cottage, such a type of country that once existed in small isolated areas closer to Sydney, but which have long since been swept away by the advance of settlement. This richer growth is due to the presence of the Upper Permian beds and the Narrabeen shales, whilst near the cottage the much poorer Hawkesbury sandstone is the only rock present.

The charm of the cabin is its quietness, and it is a unique centre from which the habits of the birds can be observed. The greater number of different species of trees also increases the number of birds that can be seen here. To the entomologist it affords an excellent collecting ground, and no doubt many Indo-Malayan types of insects, not already recorded from as far south as Sydney, will in the near future be found to occur here. A few such species have already been collected.

In addition to the remarks I and other members of the Society made on the opening day, I wish to record the great thanks of the Society to the chairman and members of the National Park Trust for their kindness in placing these two buildings at the disposal of members of this Society. It now remains for the working members of the Society to show their appreciation and to endeavour to add to our knowledge of the fauna of the Park by making as complete collections as possible, and more particularly by studying the habits of the animals in their natural surroundings.

Other members of the Society may materially help in the work that has been begun by augmenting the funds that are in hand. With better equipment, much better work can be accomplished. I therefore make an appeal for further donations towards this end. It is often thought that the naturalist should be able to put up with every inconvenience and discomfort when engaged upon his work. Much of the great work of the past has been done under these conditions, but how much better the work and how much greater the knowledge that would have been obtained, if better equipment had been with these past expeditions.

Neither the cottage nor the cabin are to be regarded as picnic resorts, they are the bases from which good work will be done, and much useful knowledge obtained. They are situated so close to Sydney, that they can be reached with ease and often a single night could be spent at either place with some specific object in view.

To this Society has come the first biological station in Australia, and it is to be hoped that it will not be the last, for there are many areas needing investigation before it is too late. One such area is the Mount Kosciuszko Plateau, where the old fauna of South-Eastern Australia calls for an intensive study. In some groups of insects, more particularly the Lepidoptera and Coleoptera, a great deal of work has already been done there, but this work is still far from complete.

Another area, at which I should like to see a hut established for a biological station, is at Barrington Tops. A party led by Professor L. Harrison, consisting of several members of this Society and some University students spent over three weeks there in the early part of this year. Despite the excessive wet weather a very large collection of insects was made (many of which are new to science), and other interesting animals were obtained. The flora was partly

investigated, and a new genus of tree fern (*Hemitelia*) for Australia was collected. The nearest locality recorded for this genus is Lord Howe Island. Important additions to the geology and physiography of the Barrington Tops were made. The specimens obtained on this trip were so numerous that sufficient time has not yet elapsed to study them thoroughly, but sufficient has been done to show that important new contributions have been made to the Natural History of Australia.

Many of the species obtained were of a distinct southern type, being only found elsewhere at Mount Kosciusko and in Tasmania. On the same days that I was catching several butterflies on Barrington Tops, Dr. Turner was collecting the same species at Cradle Mountain, in Tasmania. Though the southern element of the Australian fauna predominated at Barrington Tops, there were however many species of undoubted Indo-Malayan origin. It was remarkable to see such southern forms as *Oreixenica* flying in the same spots as *Terias* and *Catopsilia*.

It is to be hoped that the intention of the Lands Department to proclaim the Barrington Tops a reserve will be persevered with, and that provision will be made whereby a hut could be erected and permanent fireplaces established at a suitable spot to serve as a base from which the intensely interesting fauna of that district could be studied.

Another point with regard to this Society I should like to bring to your notice, and that is that the members should have one or more direct representatives upon the Trust of the Taronga Zoological Park. During the past years the relations of this Society and the Park have been very cordial, but in my opinion better results than those that up to now have obtained at Taronga Park, would be brought about, if one or more of our members with a knowledge of zoology were given seats on the Trust.

I append a preliminary list of the butterflies found in the National Park, which will serve a useful purpose in giving some account of the butterflies recorded from the Park. A beginning can thus be made towards a more complete and detailed list. The 52 species listed below are species that I know have been caught in the Park; I have undoubtedly caught many more, but until lately have not placed labels on them to distinguish them from the surrounding district. Many other species have been taken at Como, Sutherland, Stanwell Park and Clifton, most of which doubtless also occur in the Park, but so far no definite record has been obtained. Indeed, the list of the Park butterflies will probably be increased to about 100 species, for rather more than that number have been captured within the County of Cumberland. The food plants of nearly all of the species listed are known, and they will be found recorded in the Proceedings of the Linnean Society of New South Wales, 1923, pp. xvii.-xxii.

Danaida archippus. Found throughout the Park.

Ypthima arcuous. Common in the shallow gullies of the forest country.

Hypocysta euphemia. Found always near cliffs and high rocks upon which the insects are fond of alighting.

Hypocysta metirius. Very common.

Hypocysta pseudirius. Very common.

Hypocysta adiante. Very common in grassy places, especially where a little moisture is present.

Heteronympha merope. Found throughout the Park, a nearly full-grown larva obtained at the end of August.

Heteronympha mirifica. Found chiefly near the scrub areas, females at times common near the Waterfall, and when settled on the ground almost impossible to see, as when their wings are closed they resemble the dead leaves.

Heteronympha banksi. Found only in the autumn and near the scrub areas. Fond of resting out of reach on the leaves of tall trees.

Argynnina hobartia cyrila. Three females caught many years ago at the southern end in November, and one recently near the cottage in October.

Xenica acantha. Found throughout the Park, near watercourses.

Tisiphone abeona. Found in many parts of the Park in the vicinity of sword grass (*Gahnia*), the food plant of the larva.

Pyrameis cardui kershawi. Common at times.

Pyrameis itea. Found throughout the Park.

Precis villida. Very common.

Candalides xanthospilos. Abundant at times.

Candalides hyacinthina. Common.

Candalides acasta. Found usually near a low-growing species of *Cassythae*,

Candalides absimilis. Not uncommon.

Miletus ignita. Eggs and larvae feeding on *Acacia pauciglandulosa*. near the cottage during April, 1925, 63 larvae were found in the ant's nest at the base of one small plant, one butterfly seen. Larvae, pupae and imagines found near the cottage at the end of September, 1925.

Nacaduba lineata. One female seen flying round *Cupania* near the cottage.

Nacaduba biocellata. Occasional specimens found.

Zizina labradus. Very common.

Neolucia agricola. Common in September and October, larvae found during August.

Neolucia sulphitius. One specimen caught on the Mangrove island near the cottage.

Ogyris abrota. I once found numerous larvae and pupae near Audley, but most of them had suffered from the attacks of a dipterous parasite.

Ialmenus evagoros. Often very plentiful, flying round *Acacia* near the dam at Dudley, during January eggs, larvae, pupae and the perfect insects have been obtained. Pupae and butterflies near the cabin during March; also found at other spots, but always near *Acacia*.

Delias harpalyce. Occasionally seen.

Delias nigrina. Common.

Delias nipa. Occasionally seen.

Anaphacis java teutonia. At times very common.

Appias paulina ega. Occasionally seen.

Catopsilia pyranthe pythias. At times common.

Papilio aegaeus. At times common.

Papilio macleanianus. Common near the scrub areas.

Trapezites symmonus. Common in the vicinity of the food plant (*Xerotes longifolia*).

Trapezites eliena. Common.

Trapezites maheta. Found both in spring and autumn, at times common.

Trapezites phigalia. Common in the spring in fairly open forest country.

Hesperilla ornata. Common.

Hesperilla picta. Common.

Hesperilla mastersi. Three males of this rare and beautiful species were captured by me in March, on the ridge about half a mile north of the National Park Station. I have also caught it at Clifton about Christmas time.

Hesperilla donnysa. Common.

Toxidia peroni. Common.

Toxidia parvula. Common.

Dispar compacta. An occasional specimen caught.

Signeta tymbophora. One female has been taken near Waterfall, but as this local species has been taken several times in the autumn at Stanwell Park, it probably will be found to occur in many places in the Park, especially in the more open gullies near the scrub areas.

Taractrocera papyria. Caught on several occasions.

Padraona flavovittata. Common.

Padraona lascivia. Common.

Telicota augias krefftii. Common.

Netrocoryne repanda. Taken on several occasions.

Lecture by Mr. E. F. Pollock.

After the Annual Meeting, a short lecture on "Some Australian Birds" was delivered by Mr. E. F. Pollock, the Hon. Secretary of the Society.

Mr. Pollock explained that he had prepared the slides with which he illustrated his lecture from negatives which had been kindly lent to him by ornithologists whose pictures were, in his opinion, of quite exceptional merit. A series of a dozen pictures, by Mr. Rolf Keys, of Napier, New Zealand, illustrating the life history of *Sula serrator*, the Australian gannet, came early under notice. There is a "rookery" of these birds at Cape Kidnappers, the most easterly cape of the Province of Hawkes Bay, N.Z. The pictures included several panoramic views of the rookery and the adult birds, together with the nests, eggs, and young in all stages of growth. Some excellent studies, by Mr. D. W. Gaukrodger, of Blackall, Queensland, included the Emu, the ground Dove, the crested Pigeon, the White Necked Heron, the Spotted Bower Bird and others. A few pictures from negatives, by Messrs. J. S. Ramsay, H. E. Finckh and N. Chaffer were also shown. By far the largest proportion of the pictures, however, had been taken by Mr. Otho Webb, an ornithologist and bird photographer, who lives near Jandowae in Queensland. The collection was especially interesting, as embracing birds well known to New South Wales ornithologists. Excellent series of pictures illustrated the parent birds, nests, eggs and young of such birds as the Rufous Song Lark, the White Throated Fly Eater, the Black Faced Cuckoo Shrike, the White Shouldered Caterpillar Eater, the Crimson Breasted Chat, the Yellow Tailed Tit Warbler, the Sordid Wood Swallow, the Magpie Lark, the Australian Butcher Bird, the Rufous Breasted Whistler, the Striped and Fuscous Honey Eaters, the Friar Bird, the Yellow Throated Friar Bird, the Australian Pipit, the Olive Backed Oriole, the Apostle Bird and the White Winged Chough. Especially fine series were also seen of the White Fronted Heron, the Tawny Frogmouth, the Laughing and Red Backed Kingfishers, to say nothing of such well known birds as the "Jacky Winters," "Willie Wagtails" and "Yellow Bobs." Some interesting pictures were shown of Mr. Webb carrying on his photographic work almost lost to view in lofty gums or at the head of mammoth tripods made of 40 foot saplings. Illustrations of the scrubland where the birds abound added to the interest of a wonderful set of pictures.

In supporting a vote of thanks to the lecturer, Mr. A. H. Chisholm, chairman of the Ornithological Section, said that the pictures just shown were possibly unique in Australia, if not in the whole world, as a collection of Australian bird pictures. He spoke of the remarkable progress made in bird photography in recent years, and expressed the opinion that Queensland ornithologists now led the world in this respect. He complimented both lecturer and the photographers on the admirable pictures exhibited. Mr. Pollock, in responding to the vote of thanks, said it had given him immense pleasure making slides from such excellent negatives, and he hoped on some future occasion to show a further lot of bird studies, from negatives lent to him by bird lovers in other parts of Australia.

Officers for 1925-6.

At a meeting held on 27th July, the following members were elected officers for the year ending 30th June, 1926:—President, Aubrey Halloran, B.A., LL.B.; Vice-Presidents, J. H. Campbell, Dr. E. W. Ferguson, Professor L. Harrison, and Dr. G. A. Waterhouse; Honorary Secretary, E. F. Pollock; Honorary Treasurer, Donald H. Scott; Honorary Editor, A. F. Basset Hull; Honorary Librarian, Phillip Shipway; Members of Council (to fill statutory vacancies), Dr. G. A. Waterhouse, Professor L. Harrison, H. E. Finckh, A. Halloran, J. R. Kinghorn, and A. J. Nicholson.

Annual Dinner.

About fifty members and their friends attended the Annual Dinner of the Society, which was held at the Sydney University Union, on the evening of the General Meeting. Members and guests subsequently inspected the Zoology Department of the University.

New Councillors.

The following gentlemen have been elected members of the Council, viz.:—Mr. Robert C. Dixon, a life member of the Society; Mr. Ellis Le G. Troughton, Zoologist in charge of Mammals and Skeletons at the Australian Museum; and Mr. David G. Stead, the well-known naturalist.

Visit to the Capricorn Islands.

A party of naturalists, mainly ornithologists, intend visiting the islands of the Capricorn group, off the coast of Queensland, in November, to witness, investigate and record the breeding of the sea birds which abound there, and also the habits of the turtles. The party is being organised by Mr. E. F. Pollock, the Hon. Secretary of this Society, and members wishing to accompany the party should communicate with him at once. It is intended to camp on the islands for probably two or three weeks, leaving Sydney by train about November 22.

New Members.

The following new members of the Society have been elected since the last issue of "The Australian Zoologist," viz.:—

Ordinary members.—Messrs. J. J. Rouse, D. G. Stead, W. F. Henderson, C. A. Gibb, F. W. Middleton, W. F. L. Bailey, F. I. W. Harrison, O. Von Drehnen, A. J. Wood, F. J. Elder, E. S. Tribe, D. Shindler, H. J. Fitzpatrick and Dr. C. U. Carruthers.

Associate members.—Miss L. Hall, A. A. Girault, W. J. Phillips, N. C. Hewitt, A. E. Brookes, and the Royal Zoological and Acclimatisation Society of Victoria.

Obituary.

This Society has suffered severely during the past few months. The loss by death of Mr. W. C. Shipway, a Councillor for many years, was referred to in the Annual Report, and shortly afterwards our Honorary Treasurer, Mr. Donald H. Scott, died suddenly. Although he had not held office very long, his business capabilities had deeply impressed members, and his breezy genial manner had endeared him to his associates on the Council. His death was followed by that of Mr. Allan Riverstone McCulloch, a Councillor of twelve years' standing, and the author of the first Zoological Handbook published by the Society, "The Fishes of New South Wales." Mr. McCulloch died at Honolulu, where he had gone to represent this State at the Pan-Pacific Conference. Every one who had the privilege of Allan McCulloch's acquaintance will regret the loss of that brilliant young scientist whose fame as an authority on ichthyology was world-wide. His happy spirit, his adventurous nature, and his overflowing love of all created things earned for him a host of personal friends, who are now taking steps to erect a monument over his ashes at his beloved Lord Howe Island.

ROYAL ZOOLOGICAL SOCIETY OF NEW SOUTH WALES.

BALANCE SHEET AS AT 30th JUNE, 1925.

LIABILITIES.

	£	s.	d.
Income Account	113	14	7
Handbook Fund Account	235	7	5
Reserve Account	691	5	0

£1,040 7 0

ASSETS.

	£	s.	d.	£	s.	d.
Income Account:—						
Government Savings Bank . . .	114	1	5			
Less Overdraft at Commercial Banking Co., of Sydney, Limited			6 10			
				113	14	7
Handbook Fund Account:—						
Government Savings Bank . . .	47	2	5			
£200: Commonwealth 5%—due 1928, at 94½—(Present value —2nd July, 1925, at 100, 10/- = £201):			188 5 0			
				235	7	5
Investments:—						
£50: Inscribed Commonwealth 5%, due 1927, at 95½	47	16	3			
£50: Inscribed Commonwealth 5%, due 1927, at 95½	47	8	9			
£450: Inscribed Commonwealth 6%, due 1930, at par	450	0	0			
£100: Inscribed Commonwealth 6%, due 1934, at 96	96	0	0			
£50: Inscribed N.S.W. Stock, 5½%, due 1935, at par	50	0	0			
				691	5	0
£700: Face Value—(Present Value, 2nd July, 1925— £717/13/9).						

£1,040 7 0

INCOME ACCOUNT FOR YEAR ENDING 30th JUNE, 1925.

RECEIPTS.

	£	s.	d.	£	s.	d.
Balance from 30th June, 1924 ..				80	4	8
Annual Subscriptions:—						
Year ending 30th June, 1925 ..	248	17	0			
Associate Members	34	10	0			
Year ending 30th June, 1926						
—(paid in advance)	25	4	0			
Associate Members—(paid in advance)	4	17	6			
Year ending 30th June, 1927—						
(Associate Member paid in advance)	7	6				
				313	16	0
Entrance fees for New Members				19	19	0
Donations:—						
Government Grant	50	0	0			
To "Zoologist"	1	1	0			
				51	1	0
Sales— "Zoologist" —(including Reprints)				6	3	9
Biological Sections:—						
Donations				19	3	0
Interest:—						
Commonwealth Stock	40	15	0			
New South Wales Stock—(including 10/- Bonus on renewal of 1925 Stock £50) ..	2	1	0			
Savings Bank Interest on account	4	0	1			
				46	16	1
Dinner Account:—						
Sale of Tickets				12	5	0
				£549	8	6

DISBURSEMENTS.

	£	s.	d.	£	s.	d.
Publication "Australian Zoologist":—						
Printing—(including Authors' Copies)	192	8	7			
Blocks	37	12	0			
				230	0	7
Office Accommodation				52	0	0
Printing and Stationery				21	8	0
Books:—						
8 Vols. "Matthews' Birds" .. .	17	4	0			
C. Lords "Vertebrate Animals" ..	1	1	0			
Australian Museum Magazine ..	11	8				
				18	16	8
Biological Section:—						
Shipway and Berne—Legal Expenses for Lease National Park	1	2	6			
Furniture for Cottage	49	10	1			
Furniture for Cabin	30	15	11			
Insurance on Furniture	12	6				
Postage Ornithological Section ..	1	13	6			
				83	14	6
Advertising in "Great Northern" ..				2	8	0
Bank Charges and Small Items ..				2	11	0
Petty Cash—(Postages, etc.) .. .				13	11	2
Dinner Account:—						
Paid to University for 1925 Dinner				11	4	0
Balance on 30th June, 1925:—						
Government Savings Bank .. .	114	1	5			
Less Overdraft at Commercial Banking Co., of Sydney, Limited	6	10				
				113	14	7
				£549	8	6

HANDBOOK PUBLICATION FUND ACCOUNT FOR YEAR ENDING 30th JUNE, 1925.

RECEIPTS.

	£	s.	d.
Balance from 30th June, 1924	225	3	9
Handbook Sales ("Fishes of New South Wales")	15	4	
Donations	1	0	0
Savings Bank Interest	3	8	4
Interest on £200: War Bond	5	0	0
	£235	7	5

DISBURSEMENTS.

	£	s.	d.	£	s.	d.
Balance on 30th June, 1925:—						
Government Savings Bank .. .	47	2	5			
£200: Commonwealth War Bonds, 1928, at 94½	188	5	0			
				235	7	5
				£235	7	5

D. H. SCOTT, Hon. Treasurer.

We have examined the books and vouchers of the Society for the twelve months ended 30th June, 1925, and certify the above statements of Receipts and Disbursements and Balance Sheet to be in accordance therewith.

Sydney, 7th July, 1925,

(Sgd.) COATES, CUNNINGHAM & Co., Public Accountants.

BIOLOGICAL SURVEY SECTION:

At a meeting of the Royal Zoological Society of N.S.W., held at Bull's Chambers, on Friday, the 1st of August, at 8 p.m., with the president, Dr. G. A. Waterhouse, in the chair, it was decided to accept the offer of the Chairman of the National Park Trust of a cottage and cabin in National Park, and to form a Biological Survey Section of the Royal Zoological Society of N.S.W. The meeting resolved itself into the inaugural meeting of that Section, and elected the following officers:—

Chairman, Prof. L. Harrison, Vice-Chairman, Mr. A. J. Nicholson; Hon. Secretary, Mr. N. W. Cayley; Hon. Treasurer, Dr. G. A. Waterhouse; Executive Committee, Prof. L. Harrison (General Zoology), Dr. G. A. Waterhouse (Entomology), Mr. N. W. Cayley (Ornithology), Mr. E. Cheel (Botany), Prof. T. Griffith Taylor (Geography), Prof. W. R. Browne (Geology), and Mr. A. J. Nicholson (Oecology).

On the 21st of March, 1925, the Chief Secretary, the Honourable C. W. Oakes, M.L.A., handed the cabin and the cottage over to the President of the Society, in the presence of a large gathering of members and visitors. The President in turn handed over the cabin to Mr. A. H. Chisholm, Chairman of the Ornithological Section, and the cottage to Prof. L. Harrison, Chairman of the Biological Survey Section. The company was afterwards entertained at afternoon tea at Audley, by Mr. Frank Farnell, Chairman of the National Park Trust.

The cottage and the cabin have been well furnished by means of grants from the Society and donations from private individuals. Both stations have been in use, and a certain amount of useful material and information has been collected. The area near the cottage has been mapped by Miss L. D. Hall and a contour, geological and vegetation map of the country surrounding the cabin will be undertaken next month.

I. M. MACKERRAS, Acting Hon. Secretary.

ORNITHOLOGICAL SECTION.

THIRD ANNUAL REPORT.

During the year just ended, nine meetings were held, all being satisfactorily attended—an average attendance of fifteen,—at each, lecturettes and addresses were delivered, and some fine bird photographs screened, providing interest and enjoyment.

On August 22nd, 1924, Mr. A. H. Chisholm led a discussion on voice mimicry among Australian birds.

On September 19th, Mr. H. Wolstenholme lectured on "Australian Bird Names and Their Meanings."

On October 17th, Mr. E. J. Bryce gave "Some Observations on Bird-Life in North America."

On November 21st, Mr. A. H. Chisholm reported on the proceedings of the annual Congress of the R.A.O.U., held in Central Queensland during October, and Mr. H. Wolstenholme spoke on the birds observed during that trip.

On January 16th, 1925, Mr. N. W. Cayley contributed "Observations on the Plumage display of some Australian birds."

On February 20th, Mr. Tom Iredale led a discussion on the genus *Gerygone* (Fly-eaters Warblers).

On March 20th, Mr. David Uniapon, the educated aborigine, spoke of

aboriginal myths and legends relating to birds and mammals.

On April 17th, a fine series of pictures of birds, taken by Mr. Otho Webb, of Jandowae, Queensland, were shown as lantern slides by Mr. Cayley.

On May 15th, lantern slides from bird photographs were shown, the pictures being by Messrs. D. W. Gankrodger, A. E. Keane and M. Cohn.

On June 19th, Mr. P. A. Gilbert read a comprehensive paper on the "Superb Lyre-bird."

Members are justly proud of the part the Section played in the establishment of the first Australian Biological Survey Station, and are unanimous in their thanks and appreciation of the generous help afforded the movement by the members of the National Park Trust, especially the wholehearted interest of the Chairman, Mr. Frank Farnell. Acknowledgments are due also to the Council of the Royal Zoological Society for its contribution of £25 towards the expense of furnishing the cabin at Palm Creek, National Park.

At the meeting held on May 15th, Mr. Frank Farnell was presented with a painting of a Lyre-bird as a small acknowledgment of his many courtesies to bird-students.

At the meeting held on June 19th, a presentation was made to Mr. E. Nubling of a painting of a satin Bower-bird, on the occasion of his marriage.

During the year several inter-State visitors and others from country districts were welcomed at meetings.

In conclusion, it may be stated that the cabin is furnished with accommodation for six, and all members of the affiliated Societies are welcome to attend the section's meetings and to use the cabin. Application in the latter case should be made to the Chairman or Hon. Secretary of the Section.

NEVILLE CAYLEY, Hon. Secretary.

ENTOMOLOGICAL SECTION.

THE ANNUAL REPORT.

During the past year five ordinary meetings of this Section were held, the average attendance being 11 members and visitors. The August meeting of the Section was, through the courtesy of Professor Harrison, held at the Zoology Department of the University of Sydney, and an opportunity was afforded to members to inspect the extensive and valuable entomological collections of the Macleay Museum. Prof. Harrison addressed the meeting, and expressed the hope that specialists in the various orders of insects would co-operate in the naming and systematic working out of the Macleay Museum collections. Several members expressed their willingness to assist in this work.

The February meeting was devoted to the exhibition of and discussion upon the splendid entomological collections made during January and February of this year at Barrington Tops, by an expedition organised and led by Prof. Harrison. These collections will provide much material for study in distribution of Antarctic types, and the southward penetration of Papuan and Indo-Malayan derivatives.

At the April meeting, Mr. John Mann gave an account of the progress made under the Commonwealth Prickly Pear Board in the introduction and acclimatisation of insects destructive to prickly pear. His remarks were most interesting, as were also the specimens exhibited, illustrating most of the insects with which experiments are being carried out.

G. M. GOLDFINCH, Hon. Secretary.

GEORGE FORSTER'S PAINTINGS.

By TOM IREDALE.

(By permission of the Trustees of the Australian Museum.)

Plates vi.-viii.

Many naturalists have heard about J. Reinhold Forster and his son George, but very few have seen the paintings made by the latter and preserved in the British Museum (Natural History).

When Banks accompanied Captain Cook on the eventful first voyage, he engaged three artists to make paintings of the scenes, peoples and objects of natural history encountered on the trip. With regard to the latter item crude methods of preservation were in vogue, and a good picture was correctly regarded as of the first importance. The method of procedure was as follows:—As soon as a specimen was procured it was handed to the artist who made a sketch, perhaps two or three, sometimes washing on some colours, at other times adding colour notes and then handing it over to the scientific worker interested, who at once prepared a detailed description. The specimen was then preserved, or, in the case of birds apparently good for food, cooked and eaten. Consequently in the latter case the sketch and description was the only basis of all later work. The artist then finished the sketch at leisure, and, in the case of Sydney Parkinson, the natural history artist on the first voyage, the completion never eventuated as illness and death intervened. Thus all that remains of Parkinson's work is a series of unfinished pencil sketches with a few pencil notes thereon, relative to the locality and the colours of the bill and feet. These sketches make part of the Banksian Library, now in the British Museum, while the detailed descriptions simultaneously prepared by Solander are in the same place. No list of the sketches was published until 1906, though the sketches and descriptions had been examined by many workers from Latham, who saw them soon after they reached England, until Salvin almost a hundred years later. Thirty-two sketches of birds were made by Parkinson, but only one while in Australia, but as this is certainly of the first New South Wales bird it may be mentioned here. The plate is numbered 10 and shows a pencil sketch of a Black Cockatoo with the information, "The whole bird black, spots on the head and on the shoulders dirty white, the breast feathers waved with pale brown, the outer feathers of the tail scarlet and yellow with narrow fascia of black, the iris dark brown, the pupil black, the beak dirty white, with the point of the upper mandible dark grey. Black Cockatoo." Latham named this species the Banksian Cockatoo.

As soon as the second voyage was mooted Banks and Solander again made preparations to travel with Cook, but the arrangement miscarried, and the artist they had selected also declined the journey. Choice of a substitute fell upon J. Reinhold Forster, probably the ablest naturalist of his day, and certainly the most literary. Forster had already published translations into English of French voyages, and is reported to have been a master of seventeen languages. Hodges was engaged as artist, but Forster employed his son George to make natural history paintings. The same method of dealing with the specimens was continued, and some pencil sketches persist. When the voyage was completed J. R. Forster, who had made all his notes with the object of writing up a complete account of the voy-

age, was denied this privilege and forbidden to publish any such work. It was admitted that he could prepare the natural history portion, but this he refused to do. He however published some "Observations" dealing with natural history, but these were general and not descriptive in connection with birds which were scarcely mentioned. Many years later his "Descriptiones Animalium" were edited by Lichtenstein, and issued from Forster's original M.S., which had gone to the Berlin Museum. A book dealing with the voyage was published under George Forster's name, and this has been often regarded as the work of J. R. Forster, the father, but as the son soon made a name for himself he may have prepared the book. In neither the father's Observations nor the son's account do any illustrations appear. As noted above, George Forster's paintings make part of the Banksian Library, having come into the possession of Sir Joseph Banks by purchase, as recorded in Maiden's book, "Sir Joseph Banks." The paintings number one hundred and sixty-eight, and among these were two birds procured in Tasmania. Unfortunately the *Resolution*, on board of which were the Forsters, did not touch Australia, but went straight to New Zealand. The *Adventure* having become separated from her consort made a bay in South Tasmania, now known as Adventure Bay, and someone on board captured a Penguin and shot a strange Hawk. These were preserved until the *Adventure* met the *Resolution* in New Zealand, when G. Forster made pencil sketches of them. These historic birds were the Crested Penguin and the White Goshawk. A number of the paintings illustrate seabirds, the majority Neozelanic birds, and the remainder Pacific Island birds with a few from Staten Land and South Africa. On this voyage Norfolk Island was discovered, and some birds from that locality painted.

Although, as pointed out above, more than one sketch was made, in some cases no sets of duplicates of these paintings were known until quite recently when a series in the Australian Museum was recognised as the work of George Forster.

This collection of bird paintings numbers fifty-three, and was secured some years ago from the relatives of Captain Cook. The only solution appears to be that George Forster made these paintings, perhaps for services rendered, perhaps for money, for either Cook or for his cousin Isaac Smith. It must be remembered that George was engaged by his father, and not directly by the Government so that he was, comparatively speaking, a free agent. The paintings are bound in a book entitled "South Sea Birds," and numbered consecutively: the paintings are on folio sheets and to each has been appended a name taken from a MS. list pasted in the beginning of the book. This list is said to be in the handwriting of Admiral Isaac Smith, the cousin of Captain Cook, who, as a youngster, accompanied Cook on both the first and second voyages.

This MS. list is valueless and misleading, as the Admiral wrote the list in his old age, some fifty years after the voyage, and knew nothing whatever about birds. As a guide to his determination he referred to the published account and then guessed with which painting the description agreed. These remarks are here transcribed, as the book may be referred to by some one also unfamiliar with these birds. My identification of the species depicted is added in each case. In the Australian Encyclopaedia just published (Vol. I., p. 484) appears the statement: "He seems, however, to have made many duplicates, and had at least 30 redrawn in London by a more skilful artist for presentation to George III.; a good many of these came into the possession of Cook's cousin, Isaac Smith (q.v.), and are now in the Australian Museum at Sydney." As this may be read to mean that the redrawn paintings are in the Museum here, it is best to note that the ones here dealt with are by George Forster himself. The Forster paintings in the British Museum were recorded in the "History of the Collections

contained in the Natural History Departments of the British Museum," Vol. II., 179-199, 1906, and the corresponding painting is here quoted by the B.M. No., so that a correlation can easily be made. No reproductions of that series as a whole have been published, but two appeared in the Penny Cyclopaedia Vol. XVIII., 1840. On p. 40 "P. urinatrix Gm. (Forst., Draw., t. 88—from which our cut is taken," and P. vittata Gm. from B.M., No. 87, p. 47.

The following is a complete list of the Australian Museum set:—

- A.M. 1.—"A Parrot of New Zealand" (Isaac Smith) The Kaka (*Nestor meridionalis* Gmelin). B.M., No. 50.
- A.M. 2.—"A Green Parroquet of New Zealand." The N.Z. Redfronted Parrakeet (*Cyanoramphus novaezealandiae* Sparrmann). B.M., No. 46.
- A.M. 3.—"A Green Parroquet of Norfolk Island and Friendly Islands." The Horned Parrakeet (*Nymphicus cornutus* Gmelin) of New Caledonia. B.M., No. 43.
- A.M. 4.—"Hawk of New Zealand." The N.Z. Longtailed Cuckoo (*Urodynamis taitensis* Sparrmann) killed at Tahiti. B.M., No. 56.
- A.M. 5.—"A small Cuckoo." The N.Z. Shining Cuckoo (*Lamprococcyx lucidus* Gmelin). B.M., No. 57.
- A.M. 6.—"A Crow of New Caledonia." The New Caledonian Swallow Shrike (*Artamides caledonicus* Gmelin). B.M., No. 53.
- A.M. 7.—"A small Plover of New Zealand." Rail, identity uncertain.
- A.M. 8.—"A small Plover of New Zealand." Rail, identity uncertain.
- A.M. 9.—"A Kings Fisher of New Zealand." The N.Z. Sacred Kingfisher (*Saur-
opatis sanctus* Vigors & Horsfield *subsp.*). B.M., No.
- A.M. 10.—"A King's Fisher of Friendly Islands, query if not New Hebrides." The Cape Verde Islands Kingfisher (*Halcyon actaeon* Lesson). B.M., No. 60.
- A.M. 11.—"Pigeon of New Caledonia." The Tonga Tabu Fruit Pigeon (*Globi-
cera pacifica* Gmelin). B.M., No. 139.
- A.M. 12.—"Dove of New Caledonia." The Tahiti Redcrowned Fruit Pigeon (*Pholopus porphyraeus* Forster). B.M., No. 140.
- A.M. 15.—"A New Zealand small bird Fantail." The N.Z. Rifleman (*Acan-
thisitta chloris* Sparrmann). B.M., No. 164.
- Note:—Smith called this a "Fantail," though the bird shows scarcely a tail at all.
- A.M. 16.—"Small Fantail of New Zealand." The Tanna Island White Eye (*Zosterops flavifrons* Gmelin). B.M., No. 158.
- A.M. 13.—"Small Fantail of New Zealand" (Pl. vi., fig. 1). The Norfolk Island Robin (*Petroica multicolor* Gmelin). B.M., No. 150.
- Note:—J. R. Forster named this *Muscicapa dibapha* (Descr. Anim. ed. Licht. 1844, 267) and Gmelin's name (Syst. Nat. 1789, 844 error pro 944) was proposed for Latham's Red-bellied Flycatcher (Gen. Synops. Birds., 1 p. 343, n. 40, t. 50) from specimens in the Leverian Museum and Sir Joseph Banks Colln. ex Forster from Norfolk Island. This is of interest, as until quite recently the Norfolk Island and continental Australian forms were confused and Forster's locality overlooked, the Gmelinian name being used for the continental race.
- A.M. 14.—"A singing bird of New (Zealand) call'd by us the Mocking Bird." The N.Z. Bush Wren (*Xenicus longipes* Gmelin). B.M., No. 165.
- Note:—This is another bad guess by Isaac Smith.
- A.M. 17.—"A New Zealand small (bird)." The New Caledonian Flycatcher (*M. naevia* Gmelin = *Diaphoropterus montrosieri*). B.M., No. 159.
- A.M. 18.—"Cuckoo of New Zealand, call'd by us the small Wattle Bird." The N.Z. Saddleback (*Creadion carunculatus* Gmelin). B.M., No. 144.

- A.M. 19.—“Cuckoo of New Zealand, call'd by us the large Wattle Bird.” The N.Z. Crow (*Callaeas cinerea* Gmelin). B.M., No. 52.
- A.M. 20.—“A Cuckoo of New Zealand, called by us the Poya Bird.” The N.Z. Tui (*Prothemadera novaeseelandiae* Gmelin). B.M., No. 61.
- A.M. 21.—“A Cuckoo of New Zealand.” The New Caledonian Honey Eater (*Gliciphila fasciata* Sparrmann). Not included among the British Museum paintings.
- A.M. 22.—“A singing Bird of New (Zealand) called the Mocking Bird.” The N.Z. Bell Bird (*Anthornis melanurus* Sparrmann). B.M., No. 62.
- A.M. 23.—“Small cuckoo of New Zealand.” The Tonga Tabu Wattled Honey Eater (*Foulehaio carunculata* Gmelin). B.M., No. 64.
- A.M. 24.—“Small cuckoo, query New Hebrides.” The Tanna Island Cardinal Honey Eater (*Myzomela cardinalis* Gmelin). B.M., No. 63.
- A.M. 25.—“New Zealand Bird large fantail.” The Wood Swallow (not *Neozelanie*) (*Artamus leucorhynchus* Linné). B.M., No. 40, from “Poemanghee,” September 7, 1774.
- A.M. 26.—“A Wood Pigeon of New Zealand.” The N.Z. Pigeon (*Hemiphaga novaeseelandiae* Gmelin). B.M., No. 137.
- A.M. 27.—“A Duplicate of the Pigeon” crossed out. The Norfolk Island Pigeon (*Hemiphaga spadiacea* Latham. Not included in British Museum paintings. (Pl. vi., fig. 2).

This illustration may be the only one made by George Forster of the Norfolk Island bird, and J. R. Forster wrote thus of it in his *Deser. Anim.*, ed. Licht., p. 279: “Dio 10 Octobris novam deteximus insulam, quam et eodem die exploravimus, inter aves in ea observavimus pene omnes easdem, quas in nova Zelandia obvias habuimus, at omnes coloribus magis vividis et pulchris ornatas scilo *Psittacum hypopolium* et *pacificum*, *Columba argetraeam*, *Motacillam Ventilabrum*, *Procellarias Gaviam*, *tridactylum* et *fuliginosam*: in rupibus frequentes nidos habebant *Pelecani* *Piscatores*.” The *Columba argetraea* referred to was the New Zealand Pigeon which Forster had described under that name (p. 80) and was shown by the previous painting, the present one differing in the “more vivid colouring.”

- A.M. 28.—“A Cuckoo of New Zealand.” The Tahiti Reed Warbler (*Conopodera castra* Sparrmann). B.M., No. 55.
- A.M. 29.—“Grossbeak of New Zealand.” The N.Z. Thrush (*Turnagra tanagra* Sparrmann). B.M., No. 145.
- A.M. 30.—“A New Zealand Bird tame like a Robbin.” The N.Z. Robin (*Miro albifrons* Gmelin). B.M., No. 148.
- A.M. 31.—“New Zealand Sand Lark.” The N.Z. Pipit (*Austranthus novaeseelandiae* Gmelin). B.M., No. 143.
- A.M. 32.—“A Hawk of New Caledonia, South Sea, September, 1774.” The New Caledonian Harrier (*Circus juxta* Peale subsp.). Not included in the British Museum series of paintings.
- A.M. 33.—“A New Zealand Rail or Wood Hen nearly the size of a common Fowl feed about by small brooks.” The N.Z. Wood-hen (*Gallirallus australis* Sparrmann). B.M., No. 126.
- A.M. 34.—“The Painted Duck of New Zealand.” The N.Z. Paradise Duck (*Casarca variegata* Gmelin). B.M., No. 67.
- A.M. 35.—“A duck call'd Racehorse from its swiftness on running on the water but cannot fly of Staten Land. Terra del Fuego weighed 29 lb.” The Racehorse Duck (*Tachyeres cinereus* Gmelin). B.M., No. 68.
- A.M. 36.—“A Black Pintado Mother Carey Chicken of high South.” (Pl. vii., fig. 2). The Longwinged Black Petrel (*Pterodroma macroptera* Smith). B.M., No. 93.

This species is not uncommon at sea in the Tasman Sea, but is not known to breed on this side, but is also common in the Great Australian Bight, and has been found breeding in West Australia.

A.M. 37.—“A Pintatoo Bird seen in high south latitude or Pintado.” The Cape Pigeon (Petrel) (*Daption capensis* Linné). B.M., No. 96.

A.M. 38.—“A Gull call'd Port Egmont hen seen Lat. 50° S.” (Pl. vii., fig. 3). The Antarctic Petrel (*Thalassoica antarctica* Gmelin). B.M., No. 95.

From Forster's *Descr. Anim.* ed. Licht., p. 60, we find that he described the species from a specimen procured on December 26, 1772, and gave as its range “round the Antarctic Circle above 58° S.” Isaac Smith has strangely confounded this species, as the Port Egmont Hen was the name for the Antarctic Skua.

A.M. 39.—“Antaretic White Peterel or Ice Bird seen only Lat. 60° to 70°.” The Snowy Petrel (*Pagodroma nivea* Forster). B.M., No. 89.

A reproduction of this painting has appeared in the Australian Museum Magazine, Vol. ii., 226.

A.M. 40.—“Blue Peterel of Dusky Bay, New Zealand or high southern lat. (Pl. vi., fig. 4). The Blue Petrel (*Halobaena caerulea* Gmelin). B.M., No. 86.

Easily distinguished from the Prions, whether broad billed or narrow billed, by the white tip to the tailfeathers. Otherwise this is a much rarer bird and when Lichtenstein edited Forster's descriptions he had not seen it and therefore commented:—“An obscure species; I believe it not different from the Prion save in age.” Forster himself named it *Procellaria similis* as specimens of this and the next species were procured together on December 28, 1772, in the Antarctic Circle southward from the Cape of Good Hope. This species does not occur in Dusky Bay, New Zealand.

A.M. 41.—“Blue Peterel of Dusky Bay, New Zealand, or high southern lat.” (Pl. vi., fig. 3). The Broadbilled Prion (*Pachyptila vittata* Gmelin). B.M., No. 87.

This was first met with at the end of November, 1772, going into the Antarctic Circle from the Cape. Forster wrote “volant celerrime,” and was more impressed by the coloured band across the back seen when flying than with the curious broad bill. The B.M. painting was reproduced in the Penny Cyclopaedia, Vol. XVIII., 1840, p. 47. The two paintings here reproduced show the differences between this and the preceding bird well, probably better than any made since, as the wing formation is seen to differ, a character since commonly overlooked.

A.M. 42.—“Antaretic Grey Albatross.” (Pl. viii., fig. 4). The Antarctic Fulmar (*Priocella antarctica* Stephens). B.M., No. 91.

Another bad guess by Isaac Smith, as the bird figured is not an Albatross at all, but the southern representative of the Northern Fulmar with which it was confused by such early ornithologists as Forster, Kuhl and Lesson. To-day on account of the bill formation and colouration it is regarded as a distinct genus.

A.M. 43.—“Seen at sea in high South Lat. White Albatross.” (Pl. viii., fig. 1). The Snowy Albatross (*Diomedea chionopectera* Salvin). B.M., No. 99.

Forster called this “The large white Albatross,” and the specimen, from which this painting was probably made, was procured on October 24, 1772, with a wing expanse of ten feet two inches (English). From the picture reproduced the species appears to be the larger whiter one and the locality agrees.

A.M. 44.—“A Sea Bird seen in high lat. a Noddy.” (Pl. vii., fig. 4). The Wideawake Tern (*Onychoprion fuscatus* Linné *subsp.*). B.M., No. 110.

This painting was made from a specimen procured off New Caledonia on September 16, 1774, and which was described by Forster as *Sterna serrata*. This name was published, from Forster's MS. in Berlin, by Wagler, and the name is

used for the subspecific form inhabiting the Coral Sea and commonly breeding on the Great Barrier Reef.

A.M. 45.—“A small Grey Bird seen near the Cape of Good Hope, October, 1772.” A small Tern in immature plumage, the basis of *Sterna media* Forster (Ed. Licht., p. 20), the name preoccupied.

A.M. 46.—“A Shag of New Zealand that makes its nest in Trees.” (Pl. vii., fig. 1). The Booby Gannet (*Sula leucogaster* Boddaert *subsp.*). B.M., No. 108.

Another of Isaac Smith's guesses wide of the mark, as the bird figured is the Booby Gannet, which was secured at New Caledonia September 16, 1774. Forster named this *Pelecanus plotus* (Ed. Licht., p. 278) and Forster's name is used for the Coral Sea subspecies ranging through the Great Barrier Reef.

A.M. 47.—“A Crested Shag of New Zealand.” The N.Z. Spotted Shag (*Stictocorbo punctatus* Sparrmann). B.M., No. 103.

A.M. 48.—“A Shag New Zealand and Staten Land.” The Magellan Shag (*Hypoleucus magellanicus* Gmelin). B.M., No. 105.

A.M. 49.—“Small Albatross seen in Lat. 65°.” The lightmantled Sooty Albatross (*Phoebetria palpebrata* Forster. (Pl. viii., fig. 2). B.M., No. 102.

Had this painting been available many years ago there might have been no confusion as it is so unmistakable. The species was met with from “December 5, 1772—January 13, 1773” in the “Antarctic Ocean,” and through misunderstanding Gmelin's name “*fuliginosa*” given to Forster's bird was applied to a uniform sooty bird met with in warmer waters. When the icy south was later investigated this Antarctic form was again met with and regarded as a novelty.

A.M. 50.—“A Penguin of New Zealand.” The Antarctic Penguin (*Pygoscelis antarctica* Forster). B.M., No. 82.



Medallion of J. R. Forster.

This bird does not inhabit New Zealand, but was met with in the Antarctic Ocean south of the Cape.

A.M. 51.—“A New Bird seen on Staten Land Terra del Fuego January, 1774 (should be 1775) supposed to feed on shore.” The Sheath Bill (*Chionis alba* Gmelin). B.M., No. 125.

A.M. 52.—“A New Curlew seen on Staten Land Terra del Fuego January, 1774” (should be 1775). The Black faced Ibis (*Theristicus melanopsis* Gmelin). B.M., No. 117.

A.M. 53.—“Antarctic Peterel seen with the Ice, 1772. smaller than No. 39.” (Pl. viii., fig. 3). The Snowy Petrel (*Pagodroma nivea* Forster). B.M., No. 90, is a pencil outline.

While No. 39 is a larger painting there is no proof that the two paintings were intended to represent different birds, though lately it has been proved that two forms exist.

In the Australian Museum is preserved a Medallion, by Wedgwood, of J. R. Forster, which is here reproduced.

THE PRINCIPAL FAUNA OF THE COMBOYNE PLATEAU, 1923-1925.

By E. C. CHISHOLM, M.B., CH.M., R.A.O.U.

The Comboyne Plateau is situated in the County of Macquarie, on the middle North Coast, about 20 miles by air line from the sea, the nearest point being about Laurieton, a little south of east, the mouth of the Camden Haven River. The average elevation is about 2,200 feet above sea level. By air line it is about 170 miles north by a little east of Sydney, though by rail and road about 250 miles. The area of the Plateau is estimated at about 70 square miles. The average rainfall for 16 years is about 60 inches per annum. The maximum in that time was 98.87 in 1921, and the minimum 42 in 1915. For the half year to June 30th this year (1925) 51 inches fell. The maximum temperature recorded for the summer was 105°, and the minimum in winter about 30°. The whole of the centre of the Plateau is of basaltic formation and supporting rain forest or brush composed of soft wood timbers, which at the time of writing has been largely cleared. The outskirts, where the formation is of sedimentary rock, carries the usual hard wood timbers, of which Eucalyptus predominates. The fauna of the two regions differs considerably, many species being wholly confined to the one or the other area, while some are found on both. Since it has been so largely cleared, many forms which the early settlers knew are not to be found here now.

INVERTEBRATA.

VERMES.

The worms here are interesting, two species of which appear to be new.

Gordius sp. Gordian Worm. A long wiry species and cylindrical, measuring about a foot, and about a line in diameter, ringed, and with a hard integument with an opalescent sheen. Two of these were seen in shallow running water, but only one was captured, which proved to be the male, known by its forked tail, the other evidently being the female. This was in the third or free swimming stage. In the first two stages of its existence it is parasitic, living in the interior of large moths or beetles, and during these stages it feeds on its host, while during the last stage it takes no food, being concerned wholly with reproduction. I had this specimen alive in water for a fortnight. It is a Nematode.

An Oligochete. Genus and species apparently new. Specimen presented to the Australian Museum. An Earth Worm, measuring 25 inches, with a diameter about the middle of $\frac{5}{8}$ of an inch. This was ploughed up from the red volcanic soil, and is said to be not uncommon, though it is the only individual I have seen.

Digaster sylvatica. Squirter. Called so from its habit of ejecting from numerous pores of the skin simultaneously a watery fluid on irritation. This

fluid is of a nitrogenous nature and excreted by the Nephridia, or segmental organs which serve the function of kidneys. This is a comparatively short squat worm, 3 or 4 inches long, and up to half an inch in diameter, found mostly in under decaying soft wood logs, which it riddles with its burrows, evidently feeding on the decomposing wood. This is a very common species.

Microscolex modestus. This is the common garden earth worm, here being very plentiful.

A *Perichaeta* ? So far apparently a new species, as it has not been successfully identified. This species is found under logs and decaying vegetation in the brushes, and seems to be fairly plentiful.

I am greatly indebted to Dr. Anderson, of the Australian Museum, and the zoologists in charge of the lower invertebrates for identifying these forms for me.

The *Hirudinea*. Leeches. Have one representative here in an orange striped species, which so far I have not identified.

MOLLUSCA—GASTEROPODA.

Hedleyella falconari. A large snail found only in the brushes and fairly common, though it is mostly the empty shell that one comes across. I have one in my possession with a circumference of $7\frac{1}{2}$ inches, with the diameter varying from $2\frac{1}{2}$ to 2 inches.

Hedleyella atomata. Comparatively rare; one very fine example was found in the brush after a fire had been through it.

Thersites novae-hollandiae. A smaller and more depressed form of *T. dupuyana* from further south. Fairly common.

Limax (? sp.). A large slug frequenting the hard wood timber and climbing the large smooth barked Eucalypts at night and leaving its prints on the trunk which can be easily detected; it lies hidden in holes and under leaves at the base of the tree in the day time. It is 3 inches long or so with red markings at its anterior end, and about the thickness of a finger.

There is also a small black species of slug attacking garden plants.

ARTHROPODA—CRUSTACEA.

An *Amphipod*. Sandhopper. Common in the brushes amongst the fallen damp leaves or under logs. The identification of this species is under consideration at the Australian Museum. This measures from $\frac{3}{4}$ ths of an inch to 1 inch long and up to $\frac{1}{4}$ inch in vertical diameter.

Parachroeraps bicarinatus. The common fresh water Crayfish or Yabbie, is fairly numerous in the creeks.

INSECTA—ORTHOPTERA.

Orthodera ministralis (*prasina*). A little green Mantis or Praying Lady, common on garden plants, preying on small Lepidoptera and Hymenoptera.

Cyrtacanthacris exacta. A large mottled green Grasshopper, very common in grass lands in the summer months. Measures nearly 3 inches in length.

Locusta danica. Yellow Winged Locust. A smaller species than the last, measuring about 2 inches. Common.

Tryxalis rafflesii. Slender narrow-headed Grasshopper. This is very common and very destructive to garden plants. It is green, varying to salmon in colour, and reaches 3 inches in length. These are the three common Grass-

hoppers of the family *Acridiidae*.

Gryllus servillei. Field Cricket. Fairly common.

Gryllotalpa coarctata. Mole Cricket. Living in holes in the ground, it is much more often heard than seen.

ODONATA.

Of the Dragon Flies, two species stand out prominently:—

Diplax rubra. Red-bodied Dragon Fly. Fairly plentiful about running water.

Orthetrum nigrifrons. Blue-bodied Dragon Fly. This is found in the same situations as the last.

HYMENOPTERA.

Of the Ants the Genus *Myrmecia* (Bull-dog Ants) and *Iridomyrmex detectus* (Red-meat Ant) are absent from the basalt and *Ectatomma metallicum* (Green-head Ant) is rare.

Diamma bicolor. A large metallic blue flower Wasp is common.

COLEOPTERA.

Members of the Carabidae (Carnivorous Ground Beetles) are very numerous.

Macrogyrus canaliculatus. Water Beetle or Whirligig Beetle. Common in numbers in still water, flying into the house, sometimes at night attracted by the light.

Lamprima latreillei. Stag Beetle. Very uncommon about the brushes, feeding on the foliage of the Eucalypts. The family *Scarabaeidae* is well represented by several species, though I have met with neither *Anoplognathus porosus* nor *A. viridaeneus*. There is a fire-fly beetle here, but so far I have not identified it.

Zopherosis georgii. This is an extraordinary looking beetle, one individual only of which I have seen, belonging to the family *Tenebrionidae* (Meal Worm Beetles). The *Curculionidae* (Weevils) have several representatives. The *Cerambycidae* (Longicorns) the larvae of which are wood borers are well represented. The *Chrysomelidae* do not appear to be numerous.

DIPTERA.

Eristalis tenax. Bee Fly. Very common on garden flowers. The larva has a long tail, and lives in liquid refuse.

HEMIPTERA—HETEROPTERA.

The *Pentatomidae*. Shield Bugs. Fairly well represented.

HOMOPTERA.

Chlorocysta vitripennis. A small green Cicada. This is the only Cicada I have seen, though I am told that *Cyclochila australasiae* (green or yellow Cicada) has been seen here.

LEPIDOPTERA—RHOPALOCERA. (Butterflies).

Danaida archippus. Some years fairly numerous and seen nearly every month of the year. Last season (1924-1925) not at all common. Its numbers depend on its food plant *Asclepias physocarpa* (Native Cotton Plant) which, although well distributed here, in bad seasons is eaten down by cattle, so that the larva has not the same chance to develop as when it is left alone.

Danaida petilia. Not nearly so plentiful as *D. archippus*. Seen from November to May inclusive, the larva feeding on *Asclepias physocarpa*.

Euploea corinna. Seen from October to March inclusive, fairly common.

Food plants *Mandevillea*, *Marsdenia* and *Oleander*.

Yphthima arcetous. Rare; only seen two or three times in October and March on the cleared land. Food plants, grasses.

Hypocysta metirius. The only representative of the genus seen and very common in the more open parts of the partially cleared brush lands. Appearing in September and dying off in May. The larva feeds on grasses.

Heteronympha merope. Plentiful, the males appearing first towards the end of October and dying off in January, the females appearing in mid-November and disappearing in the first week of May. Food plants, grasses.

Heteronympha mirifica. Not very often seen, the males appearing in November and December, and the females from February to the middle of April. It frequents the soft wood brushes and is frequently seen about their edges.

Heteronympha banksi. Seen from the end of February to the beginning of May, and sometimes quite common in certain localities, inhabiting partially cleared brush land, where it can get plenty of sunlight. Seen more often amongst the foliage of the trees than on the ground.

Xenica acantha. The only one of the genus represented here and not common. It favours the cleared land at the edge of the brushes amongst ferns and low growth. The larvae of this and the two preceding species are grass feeders. Seen from the latter end of November to the third week in March.

Tisiphone joanna. I call this species "*T. joanna*" provisionally, as it appears to correspond more closely to this form than to the others and being very variable in its markings. One wants more material to really settle this point. If *T. joanna* is a hybrid between *T. morrissi* and *T. abeona*, as Dr. Waterhouse is endeavouring to prove with apparent success this might quite likely prove to be *T. joanna* on account of its variability, though it appears to resemble *T. morrissi* rather more closely in colouration than *T. abeona*, as the specimens with orange markings are rare compared to those without. This is only found on one side of the Plateau, on the south-west, and here its food plant *Gahnia* grows in profusion. It is fairly plentiful here.

Precis villida. Seen every month, but July and August. Some years much less common than in others. Food plants *Plantago varia* (rib grass), *Erythraea australis* (Australian Centaury), *Scabaeus*, *Antirrhinum* and *Pentstemon*.

Pyrameis kersawi. Not at all common here, except in the hotter months, and only seen from September to March. Food plants of larva *Helichrysum*, *Gnaphalium*, Cape weed, and probably other species of the *Compositae*.

Pyrameis itea. Seen in every month but July. Fairly plentiful in September, October and November. Food plant of larva *Urtica incisa* (common nettle).

Acroea andromacha. Flying from November until May inclusive. More numerous in February, March and April. Food plant here *Passiflora edulis* (cultivated Passion) and *P. alba*. Common in the brushes.

Candalides absimilis. Not at all common. Seen in January and February and again from September to November inclusive. Food plants *Castanospermum australe* (Black Bean), which does not grow here, and a native *Wistaria* (Dr. Waterhouse) and probably others.

Candalides xanthopilos. Rare, only seen once in third week of October.

Thysonotis taygetus. Only seen once here and that was a female in mid-April. Food plant *Alphitonia excelsa* (Red Ash) (Dr. Waterhouse). There must be others, as this tree does not grow here as far as I can find out.

Nacaduba lineata. What I took to be this species seen a few times in February I was unable to identify for certain on account of not being able to

procure one. Its food plant is *Cupania*.

Nacaduba florinda. I have only seen one individual and that was in the first week of March. Food plant *Trema aspera* (Peach leaf Poison bush).

Nacaduba felderi. Fairly common from December to February inclusive. Food plants several species of *Acacia* (Dr. Waterhouse).

Lampides boeticus (*damoetes*). Apparently rare here. Only seen once and that was in November. Food plants. Many of the Leguminosae such as *Dolichos*, *Cytisus scoparia* (Broom) Sweet Peas, Lupins, etc. The larvae feeding inside the pods.

Zizina labradus. Fairly plentiful and seen in every month but July. Food plant, Clover.

Lucia lucanus. Rare, only seen once and that was in February. Food plant apparently not known.

Paralucia aurifer. Rare; seen only once on the western edge at the end of February. Food plant *Bursaria* (Blackthorn) (Dr. Waterhouse).

Ialmenus evagoras. Fairly common from the later end of November till the middle of April. Food plants here *Acacia melanoxylon* (Blackwood), and *Acacia binervata* (two-veined Hickory). It is said that several other *Acacias* are amongst its food plants. The larvae are in colonies and always accompanied by swarms of the little black ant.

Delias aganippe. Very rare here and only seen 3 times in the latter end of September. Food plant *Loranthus pendula* (Mistletoe) whose host is largely *Eucalyptus* which grows mostly at the edges which probably accounts for its rarity in the centre. *Exocarpus cupressiformis* (Native Cherry) is another food plant.

Delias harpalyce. Very rare. In fact it was a great surprise to see it at all so far north. It was only seen twice, once in mid-October and again in the third week in April. Food plant *Loranthus pendulus* and probably other species of Mistletoe.

Delias nigrina. This is the common *Delias* here and very plentiful at certain times. Seen in every month but August. Food plant *Phrygilanthus celastroides* (Mistletoe) which is a parasite on several brush trees.

Delias nysa. Rare. Only seen twice, the first week in May and third week in April. Mistletoe is presumed to be its food plant.

Elodina angulipennis. Not very common. Seen from October to April. Food plant *Capparis* (Caper). *E. parthia* I have not come across.

Anaphaeis teutonia. Fairly common in season, all travelling in a northerly direction. Seen from October to the third week in January. Food plants, species of *Capparis*, though I know of none growing here. Two food plants it favours in the western country are *Capparis mitchelli* (Native Orange), and *Apophyllum anomalum* (Warrior Bush) of the family CAPPARIDACEAE.

Appias ega. Very common at certain times. Seen from November to April. Food plant said to be *Capparis* sp.

Catopsilia pyranthe. Seen from September to April inclusive and fairly plentiful. The antennae of all I have examined have been uniformly pinkish, thus favouring the variety *C. lacteola*. Food plant here *Cassia sophora*. Ova found in January and February. Larvae February to May. Pupae March and April and on to September.

Catopsilia gorgophone. I have only seen this species a few times, being in the months of February and March. Food plant *Cassia*.

Terias sulphurata. Seen in two broods. One in March, April and May, and the other in September and October and fairly plentiful at such times. Food

plant *Breynia oblongifolia* (Dr. Waterhouse).

Terias smilax. Seen from September to April flying over grass lands and fairly plentiful. One of its food plants, quoting Dr. Waterhouse, is *Cassia fistula*.

Papilio sthenelus. Very rare and only seen in February and March twice, though commoner at a lower elevation on the coast. Food plants *Citrus* and *Salvia*.

Papilio aegaeus. Fairly plentiful in most years, but this last season, 1924-5, exceptionally numerous. Seen from the third week of October to the third week in April, and especially plentiful in December, January and February. Food plant *Citrus* of several species and *Zieria*.

Papilio macleayanus. The commonest Swallow-tail here, seen every month, but rare in May, June, July and August, very plentiful at other times. Food plants *Doryphora sassafras* (Sassafras), *Cinnamomum oliveri* (Cinnamon Laurel), *Daphnanandra tenuipes* (Yellow Wood) and in other places *Camphora officinalis* (Camphor Laurel).

Papilio choredon. Not at all common. Seen from the end of September to the end of April. Food plant here probably *Doryphora sassafras* as the camphor laurel is very scarce, being very little grown.

Papilio tycæon. Not at all plentiful and only seen occasionally from the middle of February to the end of March. Not seen in 1925 at all. One of its food plants is the Custard Apple, but there must be others, as this does not grow here. *P. anactus* curiously enough I have not met with here, which surprises me, as I should have expected to see it, especially as *Citrus* trees are plentiful.

Eurycyus cressida. Decidedly rare and only seen once, and that was in November. Food plants *Aristolochia* (several species) (Dr. Waterhouse).

Trapezites symmonus. I have only seen one individual of this—in March. Food plant *Xerotes*, which is common here in the form of *X. longifolia*.

Toxidia leucostigma. The commonest Skipper here and very plentiful from October to April. Food plants probably grasses.

Padraona sunias. Fairly plentiful and seen more often on garden flowers. Food plants, grasses.

Cephrenes sperthias. Not seeing this close I am not certain of it. Only seen once or twice in February. Food plant, palms.

There are two palms growing here, viz.: *Linosyadix monostachyus* (Walking Stick Palm) and *Archontophoenix cunninghamiana* (Bangalow), both of which have been greatly restricted by the clearing of the brushes, which would account for the rarity of this species.

Hasora haslia. Distinctly rare and only seen once, and that was in mid-September. Food plant, Native Wistaria (Dr. Waterhouse).

Netrocoryne repanda. Not common and only seen a few times in October, November and February. Food plants *Callicoma* and *Endiandra* (Dr. Waterhouse).

HETEROCERA. (Moths).

Phalaenoides glycinae. Very rare and only seen once or twice—in February and December. Food plants, cultivated Grape and Virginia Creeper.

Eutrichopidia latina. Very rare. Only seen once in the month of October.

Agarista agricola. A very handsome species and seen fairly often from October to March. Food plant said to be *Vitis baudiniana (antarctica)*. One of the native grapes and probably others too.

Syntomis annulata. Very rare. Only seen once in October. An allied smaller species, fairly common.

Cizara ardenia. Rare. Only seen once—in November. Larva said to feed on the native vine (*Vitis*).

Chaerocampa celerio. The commonest *Sphinx* here. Seen in February, March and April, when it is plentiful. I have taken the larva on the cultivated grape in other districts, but here only on two species of *Arum* the common garden one and a native *Typhonium brownii*. The larva is very variable in colouration, being various shades of green, black or brown, with two large yellow eyespots on each side, one on the fourth segment with a black or dark green centre in which are from 3 to 5 yellow spots, and the other more oval on the fifth segment pure yellow.

Chaerocampa oldenlandi? A closely allied species to *C. celerio*, but I am not absolutely certain of its identity, but it appears to answer to this species. Rare and only seen once in February. Food plant of *C. oldenlandi* is said to be the cultivated Grape.

Chaerocampa erotus. Quite a rare *Sphinx* and only met with a few times in January and February. I have taken the larva of this in other districts on the cultivated grapes, it is of a light green ground colour with a narrow pink lateral line from about the fourth segment, and running to the tail, above which is a series of eight eyespots of light yellowish green surrounded by dark green, one on each segment on each side, commencing about the third. The tail appendage is pink.

Chaerocampa scrofa. Seen from September to April and fairly plentiful. Food plant *Epilobium glabellum*.

Macrosila casuarina. The specific name is unfortunate, for the larva does not feed on the *Casuarina* (Native Oak), but on the Privet (*Ligustrum*), several species, *Tecoma capensis* and I have also seen it feeding on the common olive. It is not common here, probably on account of these food plants mentioned being cultivated very little, though there is a native *Tecoma*, viz.: *T. australis* (Wonga Wonga Vine) which grows plentifully in the brushes, which probably is a food plant, though I cannot verify this. Seen flying in November and February.

Protoparce convolvuli. A very common species here. Seen from September to March inclusive. Food plants, Convolvulus and Sweet Potato, and very destructive to the latter last season (1924-5).

Pielus sp.? The larva of an interesting form, probably of the family PIELIDAE (a Wood Moth) is occasionally ploughed or dug up from the ground, which has been attacked by the fungus *Cordyceps* which has killed it and transformed it into a hard woody material, while the contour of the Caterpillar is perfectly preserved, the legs and every segment being well defined, even to the smallest detail. These transformed larvae are generally found embedded perpendicular to the surface with the head end uppermost and at no great depth. In all the specimens I have seen there has been no central stipes growing upwards from the head end as seems to be the case with the species described from New Zealand where the stipes reaches a height up to 9½ inches above the surface and is likened to a miniature spike of the grass tree (*Xanthorrhoea*). The specimens found here have a root like attachment to one side of the head and growing at an angle with it, but no sign of stipes showing above the surface of the ground. I exhibited a specimen 4½ inches long with a diameter of ½ inch at a meeting of the Linnean Society on June 24th, 1925, when an interesting discussion took place. Another specimen was exhibited for me at a meeting of the Naturalists' Society on October 7th, 1924.

Metura elongata. A case moth, only seen very occasionally in the larval form, probably preferring the hard wood timber to the brushes. This is the only case

moth I have met with.

Doratifhora casta. The only cup moth I have seen here, the larva of which was feeding on *Eucalyptus saligna* (Sydney Blue Gum). The larvae were found in March and April, when they pupated underground until December and January, when the imagines appeared.

Nyctemera amica. A day-flying species and fairly common. Seen from September to January, when it is plentiful and occasionally seen in March and as late as June. Food plant *Erechites prenanthoides* of the family COMPOSITAE.

Darala (teara) contraria. Rare and only seen once. The larva of this is one of the "processional caterpillars" moving from place to place in search of food plants in long lines. The larva is gregarious, living in log shelters formed of silk, generally at the butts of their food tree and feeding nocturnally. Food plants, different species of *Acacia* to which they are very destructive, denuding tree after tree of its foliage, and, if in large numbers, destroying every tree in their neighbourhood. Seen flying in November.

Apina callisto. A day-flying species, inhabiting grass lands. Not common here and seen only a few times in April and May. Food plants probably grasses.

Chelepteryx felderi. A very variable species as to colouration from French grey or lavender to brownish grey on the upper surface of forewings, and from bright pink to brownish grey on the upper surface of hindwings. About the centre of the costa of forewing on the upper surface is a black line running diagonally towards the base on each side of which within the cell is an eyespot. The under surface of wings is very beautifully marked in black, brown and red with two large white spots on the forewing, corresponding in position to the eyespots on upper surface. Only one individual of this species and only the remains of that was found in April, having evidently been freshly killed by a bird. The larva of this has coarse bristly hair and lives on the ground under leaves and feeds nocturnally. What its food plant here is I do not know, but one of its food plants is *Xylomelum pyrifforme* (the Native Pear) which does not grow here. The moth measures $4\frac{1}{2}$ inches across the wings.

Teia anartoides. Not common here. The larva is hairy, having several tufts of hair on the back projecting beyond the general surface. This is a pest in some localities at certain times of the year, attacking garden plants of many kinds.

Euchloris submissaria. A Geometrid. Fairly often seen. Having a protective colouration of a light green and with its wings spread on a tree trunk, it is difficult to detect.

Agrotis infusa. Bugong Moth. Not at all common and only occasionally seen. The larva of this is a cut worm.

Maenas (ophideres) salamina. A very handsome species, measuring $3\frac{1}{2}$ inches across the outspread wings, the fore pair of which are dark green on the upper surface, the veining showing as red lines, the costa is deeply margined with opalescent cream, profusely dotted with green and purple spots, the upper surface of hindwings is orange yellow with broad black markings. This is rare here. I have only seen it once—in April. When settled it forms a triangle of dark green, edged with cream, which projects over the head, forming a hood. It belongs to the family NOCTUIDAE.

Dasypoda selenophora. Only seen occasionally, from December to February inclusive in the house.

Pericea spectans. Not common. Seen in the house in November. February and April.

ARACHNIDAE.

The ARANEIDAE (Spiders) are plentiful. The genus *Lycosa* (Ground Spiders) appears to be poorly represented.

Latrodectus hasseltii. Red-back Spider. I have not met with this species.

Isopeda villosa. So called "Tarantula," the real *Tarantula* belonging to quite a distinct family, not represented in Australia. This is seen at times, especially on the walls or ceilings of houses and frequently before a change of weather. This is a very useful species in a house, killing an enormous number of small flies. I have watched with great interest its manner of procuring its prey. It stalks the fly till fairly close and then springs on it. There are many other spiders unidentified. Of the ACAREIDAE (Mites and Ticks):—

Ixodes holocyclus. Brush Tick. This is common in the brushes, the poison being very virulent, causing death frequently in the smaller domestic animals by a gradually progressive paralysis, starting with hind limbs and ending with paralysis of the respiratory or circulatory centres, or both. This species is holding the fox in check in the brush country, only until such time as the latter acquires immunity.

Myriopoda. Represented by the common Centipede, which is plentiful and a Millipede.

VERTEBRATA.

PISCES.

Anguilla reinhardtii. Long-finned Eel. Fairly plentiful and growing to over 4 feet in length.

Introduced.

Salmo irideus. Rainbow Trout. This fish was introduced here many years ago, but did not survive and all trace of it has disappeared. With the aid of two residents here, Mr. Tom Jones and Mr. R. Rubie, who kindly volunteered to bring a consignment of the fry of this species from Wingham, where I had arranged for it to be sent by train to the Comboyne, I was enabled to liberate 1,500 fry, about 6 weeks old, in Thone Creek, on September 10th, 1924, in their company and with their help. They appear to be doing well.

AMPHIBIA—ANOURA.

Hyla caerulea. Great Green Tree Frog. Very rare and only seen once, and never heard.

Hyla peronii. Brown Tree Frog. Seen on several occasions about the garden and pot plants on verandah, but probably the same individual. This was biscuit-coloured with punctiform markings of green all over its dorsal surface and with orange yellow and black markings on inner surface of thighs.

Hyla aurea. Green and Golden Bell Frog. Does not occur here.

A brown frog, found under logs in moist situations in the brushes with a marbled under surface with a carmine patch on the opposed surfaces of thigh and body. I take it to be *Cryptotis froggatti* or possibly *C. haswelli*. Fairly common. There are several other unidentified species, though frogs, as a class, are not very plentiful.

REPTILIA—OPHIDIA.

Python variegatus. Carpet Snake. This is the only representative of the family Boidae here. *P. spilotes* (Diamond Snake) being absent. This is not nearly so much in evidence as it used to be on account of the brushes being cleared for grazing land. It is seen in the outlying parts occasionally, but is not plentiful. In some places it is encouraged to take up its abode near barns on account

of its propensity for killing rats and mice, but the majority of people kill it on sight.

Pseudechis porphyriacus. Black Snake. The commonest snake we have, though it is said by old residents that before the brushes were cleared it was very seldom seen. It prefers the cleared country and is frequently found in the neighbourhood of swamps and creeks, a large part of its food being frogs. It is quite at home in the water and is said occasionally to feed on small eels, as they have been found in the stomach. I think, too, that crayfish probably form part of its food. It is not very often that one hears of cases of bite from this species considering its numbers and how widely distributed it is in every sort of country, though I had a case under my care quite recently. The mortality from the bite of this species is very low, especially when inflicted through clothing, which absorbs a large portion of the venom.

Notechis scutatus. Tiger Snake. This is not a common species and found generally in or near the brushes, and is greatly feared here. It nearly always shows fight and is very agile. I know of a dog being killed here after a desperate fight with one, which it killed, and died a few hours after. This snake varies considerably in its colouration, sometimes the bands are only just distinguishable, at others well marked.

Acanthophis antarctica. Death Adder. I am not quite satisfied in my mind whether this is here or not. I have not seen it, though always on the look-out for it. On the other hand I have been assured by men who should know it that it has been seen and killed here.

Furina occipitalis. Black and White-ringed Snake. I have only seen this once and don't think it is very plentiful. This goes by the name of "Bandy Bandy" here, and is looked upon as being very deadly, whereas it really is harmless. Though belonging to the family COLUBRIDAE and subfamily ELAPINAE of the division *Proteroglypha* the poison fang is so small that the result of a bite is likened to that from the sting of a bee.

Pseudelaps squamulosus. Red-bellied Snake. This is a small species less than a foot in length, found in rocky situations in hard wood country at the edge of the Plateau. It is a handsome species, of a blackish colour, on dorsal surface, crimson on under surface. The head is black on top, surrounded by dirty white at the edges, which is continued down each side of the neck for a distance of from half to three-quarters of an inch in a gradually tapering streak. I have only seen one individual of this species, though it is probably fairly plentiful. This snake again, although it belongs to the subfamily Elapinae which includes the deadly venomous species would be practically harmless, having a very small poison fang.

Demisonia signata. Black-bellied Snake. Not common.

LACERTILIA.

Ablepharus lineo-ocellatus. Small Garden Lizard. Very uncommon in the brush country and seen mostly off the basalt.

Lygosoma (siaphos) aequale. A very common lizard, found under logs in cleared country. The color is an opalescent brown above with an orange under surface, with a broad black band on the sides. There are only two fully developed toes with a third rudimentary one on the radial aspect of each pair of feet, which are far apart. The tail is longer than the body and ends bluntly like that of a snake. It is evidently a transitory form.

Lygosoma (hinulia) quoyi. A lizard. Only occasionally seen about logs in the semi-cleared brush.

Amphibolurus muricatus. Common Dragon. Very uncommon and only seen amongst hard wood country at the edge of the Plateau. *Physignathus lesueurii*. Eastern Water Dragon. Appears to be absent, though common at the base of the Plateau in waters flowing from it.

Pygopus lepidopus. Common Slow-worm. I have only met with one individual, which was sent to me for identification in a very battered condition under the impression it was a snake.

Varanus varius. Lace Lizard or "Goanna." Does not exist on the Plateau, though one was noted here years ago.

The *Chelonia*. Tortoises. Are not represented here.

AVES.

Allectura lathamii. Brush Turkey. Fairly numerous on the outskirts of the Plateau and on the slopes where the brushes are still standing, and they are less likely to be disturbed. In these localities I have seen their nesting mounds several times. As the foxes get a hold here these birds will gradually become extinct. The brush tick at the present time is one of the worst enemies of the fox, and seems to be holding him in check, but before long he will acquire immunity. The Dingo, which is numerous here, is another enemy of the brush turkey, raiding the nesting mounds for the eggs.

Coturnix pectoralis. Stubble Quail. I have come across quail once or twice singly or a pair together in the open, but only on the wing, which seem to be this bird.

Ptilonopus magnificus. Wampoo. Called here "Bubbly Mary," a name probably given to it by early Scotch settlers on account of its peculiar call, often corrupted into "Bubblo Mary."* This fruit pigeon is a very handsome bird and at certain seasons when particular berries or native fruit such as figs are ripe is to be found in the dense brushes on the outskirts of the Plateau.

Lopholaimus antarcticus. Top Knot Fruit-pigeon. Commonly called here "Flock Pigeon" on account of its habit of associating in numbers. This is quite a common bird at certain seasons, feeding on many different kinds of fruit and berries, found in the brushes. *Ficus macrophylla*, The Moreton Bay Fig, and others of the genus are among its favourite food trees. It is very fond of the fruit of *Acronychia laevis*, a tree bearing white berries in profusion.

Columba norfolciensis. White-headed Fruit Pigeon. Called locally "Baldy" on account of its white head. Not at all common, but appearing as certain brush fruit ripens, mostly keeping up in the highest trees and very difficult to detect.

Macropygia phasianella. Pheasant-tailed or Brown Pigeon. Fairly common, frequenting the lower shrubs and often seen feeding on the ground on fallen berries. It allows a much closer approach than the preceding species.

Geopelia placida. Peaceful Dove. Not very plentiful and only seen in small numbers. It feeds on the ground on seeds.

Chalcophaps chrysochlora. Green Pigeon. This is another ground feeder and fairly common. It is generally met with in the brushes, never more than two together, and often seen singly.

Leucosarcia melanoleuca. Wonga. Another ground feeder and fairly plentiful, not so often seen as heard. It rises from the ground with a great "whirring" and alighting on a bough it will remain perfectly still, allowing one to walk quite close underneath. It is an inhabitant of the brushes.

Phalacrocorax carbo. Black Cormorant. Very rare here, only occasionally one seen.

* Compare "Bubbly Jock," the common Turkey of the Barnyard.

Phalacrocorax varius. White-breasted Cormorant. This is more frequently seen than the last bird, though only rarely one or two together may be encountered. The scarcity of feed probably accounts for this. The only native fish are eels, although lately I have been instrumental in having the Rainbow Trout *Salmo irideus* liberated in one creek here. It seems to be a disputed point as to whether the Cormorant does as much damage as it is supposed in the matter of destroying fish, as one of its main foods is the crayfish, which itself does a good deal of damage in destroying the ova and probably young fish. Therefore, it is necessary that its habits and food should be carefully studied to see on which side the balance lies. It has been stated by competent authorities that, when these birds have been thinned out in certain localities, the fish have diminished more rapidly on account of the extra increase of the crayfish.

Lobibyx novae-hollandiae. Spur-winged Plover. Seen occasionally about the low-lying open land, especially in the neighbourhood of creeks.

Burhinus magnirostris. Stone Plover or Land Curlew. Heard and seen mostly on the southern and western parts of the Plateau, but not plentiful.

Threskiornis spinicollis. Straw-necked Ibis. At certain times of the year fairly numerous, feeding in the open cleared lands. This species ranks high among our useful birds, the grasshopper forming a large part of its food when that insect is prevalent.

Notophoxyx novae-hollandiae. White-fronted Heron. Only seen occasionally about the creeks.

Nycticorax caledonicus? Only seen once and, as it was on the wing, I am a little doubtful of the species, but it seemed to be this bird. It was flying along the course of a creek.

Anas superciliosa. Black Duck. Very rare here. I have only once seen a pair on the main creek. This is the only species of duck I have seen, though the Wood Duck (*Chenonetta jubata*) is reported to have been seen here in days gone by.

Astur novae-hollandiae. Grey Goshawk. Uncommon and only seen once in the brush forest.

Astur fasciatus. Goshawk. Only occasionally seen about the brushes.

Accipiter cirrhocephalus. Sparrow Hawk. I have only seen it a few times but as it inhabits the dense brushes it is probably much more numerous than it appears to be.

Uroaetus audax. Wedge-tailed Eagle. Seen rarely and sometimes a pair together, especially soaring over the open country.

Haliastur spheurnus. Whistling Eagle. I have only seen this bird once.

Ieracidea berigora. Brown Hawk. Not very common, but seen occasionally.

Cerchneis cenchroides. Kestrel. Seen especially in the autumn months and generally two together.

Ninox boobook. Boobook Owl. Fairly numerous here and mostly found in the brushes. Frequently heard at night in spring and summer.

Tyto alba. Barn Owl. Occasionally seen flying in the dusk. It feeds diurnally, too. I have disturbed it feeding on a rat in the early afternoon. This goes by the name of "Screech" Owl owing to the peculiar loud and weird call.

Trichoglossus moluccanus. Blue Mountain Lorikeet. I have never seen it in flocks here but in pairs, and they are not plentiful. They feed when amongst the brushes on berries and fruits, while in the hard wood timber they follow the Eucalypts in blossom for the nectar.

Calyptrorhynchus funereus. Yellow-tailed Black Cockatoo. This is to be found both amongst the hard woods and in the brushes. A large part of this

bird's food is composed of Lepidopterous and Coleopterous larvae, which it extracts from under the bark and in the sapwood of the timber trees. Generally seen here in small flocks, but by no means plentiful. *C. banksii*, the red-tailed bird, I have not come across, but it is said to inhabit the fringe of hard wood timber at the edges of the Plateau, feeding to a large extent on the fruit of the *Casuarina*. Nor have I seen *Callocephalon fimbriatum* (The Gang Gang) also reported to be here, which I can quite believe, but only amongst the hard woods of the rugged country at the edge of the Plateau.

Cacatua galerita. White Cockatoo. Fairly common, at times in small flocks, and frequently seen in the brushes, probably feeding on some of the hard fruits of the brush trees.

Aprosmictus scapularis. King Parrot. Fairly numerous, especially about the brush timber, where it finds plenty of food in the shape of fruit and berries. Generally seen in small flocks with perhaps only one bird in adult male plumage.

Platycercus elegans. Lowry or Crimson Parrot. This is the most common of the family, inhabiting the brush country, largely for the sake of the many different kinds of fruit to be found there.

Platycercus eximius. Rosella. This is quite a rare bird and found mostly in the clearings or at the edge of the brush timber where it feeds largely on the seeds of the Scotch Thistle. In course of time this bird will probably increase as the timber is cleared. On the coast in the neighbourhood it is quite plentiful.

Podargus strigoides. Frogmouth or More Pork. Probably fairly numerous, but seldom seen, and keeping mostly to the hard wood timber outside the basalt. I have only come across one bird and that happened to be within a few feet of the ground.

Eurystomus orientalis. Dollar Bird. A migratory species. A few birds seen in spring and summer, but by no means numerous.

Dacelo gigas. Laughing Jackass. Common; often found in the brush timber, where it gets a plentiful supply of food, consisting of worms and grubs, found amongst the decaying leaves on the ground. Also seen in the open cleared land.

Halcyon sanctus. Sacred Kingfisher. A migratory species, and only seen here in the spring and summer preferring the open forests, though seen in the brushes, especially when they have been partially cleared.

Hirundapus caudacuta. Spine-tailed Swift. In the late summer fairly plentiful; sometimes seen in great numbers. Part of its food consists of Hymenoptera, as in two instances which have come under my notice it has been found to have been feeding on a large blue wasp.

Cuculus pallidus. Pallid Cuckoo. A rare bird here. I have only seen it once, and never heard its peculiar note, which is so conspicuous in other parts of the State in the spring months. This is a migrant.

Cacomantis flabelliformis. Fan-tailed Cuckoo. This is a migrant, though I have known it in certain localities in some years to remain the whole year through. I saw one this year (1925) on July 19th, which rather points to its being stationary in this district, though it appears to be more numerous in the hot months.

Cacomantis pyrrhophanus. Square-tailed Cuckoo. This is a rarer bird than the last. I have only come across it here amongst hard wood timber at the edge of the Plateau.

Lamprococcyx plagosus. Green Bronze Cuckoo.

Chalcites basalis. Narrow-billed Bronze Cuckoo. One or other of these I have seen or perhaps both once or twice, but have not been close enough to identify. Not seen in the brushes.

Eudynamis orientalis. Koel. Called here the "Corn Planter," as it arrives

about the middle of October at the time the corn is planted, and is heard till about the middle or last week of March. Its peculiar call from which it derives the name of "Coo-ee Bird," is much more often heard than the bird is seen, and it can be heard for long distances. It is an exceedingly shy bird, and it often requires a lot of stalking in thick scrub before a view is obtained of it. It is by no means plentiful.

Centropus phasianus. Pheasant Coucal. Not very common. Seen occasionally in cleared low-lying land, which is covered with long grass or bracken. Much more often heard than seen.

Menura novae-hollandiae. Lyre Bird. Commonly heard in the bushes, but as these are gradually being cleared the birds are getting fewer. I can't help thinking that it is only a matter of a comparatively short time before it becomes extinct, for it has numerous enemies and when the fox becomes immune to the attacks of the tick, this bird will rapidly disappear. The Dingo, which is prevalent here, is another of its worst enemies. Laying only one egg doesn't give it the same chance as in the case of a bird laying many. Its nesting site, again, being close to the ground is very vulnerable, and probably many adult birds are caught while sitting on the nest. It nests in the winter months, which is prolonged into early spring. I have found a fresh egg here on July 13th and again on September 7th. In both cases the nests were deserted later from the old bird being caught on the nest judging from the numerous adult feathers all round the nest. This is undoubtedly the best mimic we have and perhaps the finest in the world. The dancing mound seems to be the most favored place for mimicking purposes, and here it goes through some grotesque movements with its tail which is in a state of quiver all the while, being spread to its fullest. I was lucky enough to witness this partially from a distance once.

Hirundo neoxena. Welcome Swallow. Common here as in most places, but most numerous in the spring and summer. Its movements here are peculiar. It appears every now and again in mid-winter for a few days and disappears again. This year (1925) I saw a pair on July 20th for a short time in fairly cold weather, though the day was sunny.

Hylochelidon nigricans. Tree Martin. Seen fairly often in the warmer months, especially about standing ringbarked forest timber and often seen flying in the company of *Hirundo neoxena*. It evidently breeds here amongst the dead timber.

Rhipidura flabellifera. Grey Fantail. This bird hardly seems a migrant here, as I have seen it in mid-July, though this may be an exception as they are more numerous in spring and summer. This is an inhabitant of the open forests, being seldom met with in the bushes.

Rhipidura rufifrons. Rufous Fantail. Unlike the last bird this is strictly migratory and prefers the dense brush to the open. It is fairly plentiful during the spring and summer.

Rhipidura leucophrys. Wagtail. A stationary bird, seen all the year, and fairly common, preferring the open country. Often in association with the Peewit and frequently building its nest right under the nest of that bird, probably as a protection against wet weather, though one of its favourite sites for a nest is on a branch overhanging water.

Seisura inquieta. Restless Flycatcher or "Grinder." A migratory species and seen here generally in the autumn months, evidently on the move. Not common.

Monarcha melanopsis. Black-faced Flycatcher. A migrant, only seen here in the spring and summer, and fairly plentiful. This bird has some pretty liquid

notes. Generally seen in the brushes.

Microeca fascians. Jacky Winter. Apparently a stationary species, though it is mostly seen in the cold winter months. Probably the explanation is found in the fact that it gets into the forest timber for the breeding months and is therefore not so evident and comes out into the cleared land where its food supply may be more abundant in the cold months of winter. It is not very plentiful. I have heard this bird giving forth quite a sustained song in which were incorporated the notes of a canary which was kept in its neighbourhood. I consider it quite a songster, at its best in the early morning catching the first rays of the sun from a high eminence.

Petroica phoenicea. Flame-breasted Robin. Only seen in the open here in autumn and winter breeding in the hard wood forests, but not inhabiting the brushes. Generally in small companies in which one male in full plumage is seen to perhaps a dozen grey birds, both females and young males. The males do not take on their full plumage for at least one year, as I have found two grey birds sharing a nest with eggs. This is one of the hosts of *Chalcites basalis* (the Narrow-billed Bronze Cuckoo), but not so far as I know of *Lamprococcyx plagosus* (the Green Bronze Cuckoo).

Erythrodryas rosea. Rose-breasted Robin. An inhabitant of the brushes, not so often seen, but probably much more numerous than it appears to be as it mostly keeps to the high branches of the brush trees, feeding in such situations and not on the ground.

Eopsaltria australis. Yellow Robin. Fairly numerous, preferring the brushes to the more open country. Very tame in disposition, it allows a close approach, and if one stands still for a while it will sometimes dart to within a few inches of one's feet to pick up an insect.

Pachycephala pectoralis. Golden Whistler. This is a stationary bird in contradistinction to *P. rufiventris* which is a migrant and which I have never seen here, preferring the open forest lands. *P. pectoralis* is an inhabitant of the brushes and fairly common.

Colluricincla harmonica. Grey Shrike Thrush. Not very plentiful, inhabiting both the brushes and the more open country. One of our best songsters. Pairs are few and far between, each pair keeping to one locality.

Grallina cyanoleuca. Peewit. Quite common here. This is one of our most useful species, feeding largely at the edge of swamps and lagoons, it is said, on the pond snail (*Bullinus*) which is an intermediate host of the liver Fluke (*Fasciola hepatica*), a great enemy to the pastoralist, especially in wet seasons in certain localities. By its feeding on large grasshoppers (plague locusts) also it does an immense amount of good.

Falcunculus frontatus. Yellow-breasted Shrike Tit. I have only seen this bird once and that was in the brush, though it is probably more common amongst the Eucalpts at the edge of the Plateau.

Graucalus novae-hollandiae. Blue Jay. A migrant, appearing in the spring in small flocks, and departing again in the autumn. I have seen it here as late as April 30th. This is another useful species, feeding in the tree tops, taking insects off the leaves on the wing. Occasionally attacking fruit, which seems to form a small part of its food.

Cinclosoma punctatum. Spotted Ground Bird. Found on the edges of the Plateau in the more open country, especially in localities where low vegetation abounds and often in rocky situations. Only occasionally seen.

Oreocincla lunulata. Mountain Thrush. A rare bird and only seen once in the brush feeding amongst fallen leaves, and this is just the situation one would

expect to find it in numbers; probably when the brush was more extensive it was more numerous; being a ground bird, many have probably fallen victims to some of the Carnivora.

Acrocephalus australis. Reed Warbler. Very rare. Only one seen.

Gerygone fusca. Brown Flyeater. Very common, feeding amongst the branches of the brush timber and often in small flocks. *G. albogularis* (Native Canary) I have not seen here.

Acanthiza lineata. Green Tit Warbler. Only seen on the outskirts of the Plateau amongst the Eucalypts, generally in small flocks.

Acanthiza pusilla. Brown Tit Warbler. Common about the scrubs often in association with *G. fusca*. It does not congregate in flocks, but is seen singly or in pairs, feeding amongst the lower vegetation.

Geobasileus reguloides. Buff-rumped Tit Warbler. Only seen at the boundary of the basalt amongst the hard wood timber and not very plentiful.

Geobasileus chrysorrhous. Yellow-tailed Tit Warbler. Not common and found in semi-cleared land where a few shrubs have been left, generally associating in small flocks.

Sericornis lathamii. Yellow-throated Scrub Wren. Not often seen on account of its habitat being the dense brush; it is also very shy. It is probably much more numerous than it appears to be. I have seen it occasionally feeding with other species in low scrub in more open country.

Sericornis frontalis. White-browed Scrub Wren. Like the last bird, this is an inhabitant of the brushes, though much more often seen in the more open scrub. It is not so shy as *S. lathamii*. These two species are sometimes seen feeding together.

Malurus cyaneus. Blue Wren. Not often seen.

Malurus lamberti. Variegated Blue Wren. Even less frequent than the preceding, but living in dense undergrowth, it may be more numerous than it appears to be. The habits of the two species are very alike. This is a shyer bird than *M. cyaneus*.

Artamus cyanopterus. Dusky Wood Swallow. This is the only representative of the genus I have seen here, inhabiting the outskirts of the Plateau mostly or where the land has been partially cleared. It congregates in small companies. In some localities remaining all the year, in others migrating.

Psophodes olivaceus. Coach Whip. This is an inhabitant of the brushes and is fairly common, though much more often heard than seen. It lives close to the ground and is very shy.

Climacteris leucophaea. White-throated Tree Creeper. Seen in both brush and hard wood timber. Not a common bird here.

Dicaeum hirundinaceum. Mistletoe Bird. I have only seen it once here, though it is probably fairly common. The Mistletoe in the brushes is generally on the higher branches of tall trees, which makes it a difficult matter to detect the bird.

Pardalotus punctatus. Spotted Diamond Bird. Not seen about the brush timber, but amongst the Eucalypts at the edge and slopes of the Plateau. This is the only one of the genus I have seen here.

Zosterops lateralis. Silver Eye. Very numerous here and seen in large flocks, having plenty of native fruits to feed upon, especially in the warmer months, though it is essentially insectivorous, and if fed on fruit alone soon becomes ill and dies. I consider this one of our most useful birds, feeding on many noxious insects, including Lepidoptera in all stages, especially the smaller moths. This is a bird generally condemned as harmful, especially by the fruit grower,

and incessant war is waged on it. It does do a good bit of damage to the soft fruits, but if one takes the trouble to observe it closely he will be surprised to find how quickly it clears up an infested orchard if given free play. It is the one bird of all to search for and find the hiding places of the Codlin Moth, and where woolly aphids is prevalent it will quickly clear it up. I speak with a clear knowledge of this bird, for I have kept it in captivity and noted its food. It is an insectivorous species, first and last, but, being a honey eater, it has a partiality for sweet substances, and, like many others of the honeyeaters, it feeds on native berries and fruits when nectar from blossoms is scarce, and thus takes toll of orchard fruit when it gets the opportunity. In the case of this bird a clear knowledge of its food is essential before condemning it as noxious. I am firmly of the opinion that the reason our orchards are so widely infested with insect pests at the present time is largely due to the destruction of this species, the balance is so overwhelmingly in its favor. In a pamphlet issued by the Department of Agriculture entitled "The Food of Australian Birds," July, 1918, under the heading *Zosterops coerulescens* p. 74, will be found the results of the analysis of the stomach contents of many individuals of this species from all over the State, and at varying times of the year, showing the variety of insects this bird consumes.

Acanthorhynchus tenuirostris. Spine-bill. Not often seen. As the *Proteaceae* family of plants is very poorly represented here this may be the reason. It seems to feed largely on the nectar of *Loranthus* (Mistletoe). *Banksia*, *Lambertia* and *Grevillea* are absent, and these are amongst its favourite food plants.

Meliphaga lewinii. Yellow-eared Honeyeater. This is the common *Meliphaga* of the brushes and is fairly plentiful, feeding to a large extent on native fruit of various kinds.

Meliphaga chrysops. Yellow-faced Honeyeater. Very rare and only seen once, preferring the more open forest country.

Myzantha garrula. Soldier Bird. A very rare species here. A pair were seen about the partially cleared land for a week or so, but not seen since. On the coast in the neighbourhood it is quite common amongst Eucalypt timber.

Anthochaera carunculata. Gill Bird. Very rare here and only seen once, though probably more often seen amongst the Eucalypts at the boundary of the Plateau.

Philemon corniculatus. Leather Head. Common at certain times—the autumn and spring—when it is on the move, as it is a migrant. On the whole the *Meliphagidae* are very poorly represented on the Plateau. Being the most numerous family of all, one would have expected a greater variety here.

Anthus australis. Ground Lark or Pipit. Fairly numerous on the cleared land. Evidently a recent acquisition since clearing has taken place, as before this the whole of the central part of the Plateau was a dense brush.

Aegintha temporalis. Red-browed Finch or Red Head. Quite numerous in small flocks, seen mostly at the edge of the brushes. This is the only Finch here. Although I have been told that *Zonaeginthus guttatus* (the Diamond Sparrow) has been seen here, I have only seen it on the lower levels.

Oriolus sagittatus. Olive-backed Oriole. An isolated bird, seen now and again, but it is not very common. It feeds on the native fruits and berries, which it swallows whole. One of its foods is the introduced Ink Weed (*Phytolacca octandra*) which is plentiful here. It is insectivorous, feeding on Lepidopterous and Hymenopterous larvae. I have watched it feeding on the stem Saw Fly larvae, which infest gum (Eucalypt) saplings.

Chibia bracteata. Drongo Shrike. Seen occasionally inhabiting the brushes.

It is shy and very difficult to approach close enough to identify, for it keeps mostly to the higher branches, and is always on the move.

Ailuroedus crassirostris. Green Cat-bird. Fairly common at the western side of the Plateau.

Ptilonorhynchus violaceus. Satin Bower Bird. One of the most numerous birds in the brushes. Generally seen in small companies. Its main food consists of many brush fruits and it has become rather a menace to orchards. A male in full plumage is quite a rarity compared to the number of females and immature males in green plumage, accounted for by the fact that the males do not assume the blue-black dress for some years. The bowers are generally well hidden and apparently are used as play houses in the early morning and evening when the birds begin to assemble. Strewn all round are snail shells and blue parrots' feathers.

Sericulus chrysocephalus. Regent Bird. This is another bower builder, but not such a common bird as the last, and it is quite uncommon to find a bower. These two bower birds are frequently associated and, like the last bird, the males do not don full dress for some years, consequently one more often sees the grey bird. The food consists of brush fruit and insects. Being an inhabitant of the brushes and shy, it is difficult to observe.

Ptilorhis paradisea. Rifle Bird. I was lucky enough to see one of these once in a brush on the outskirts of the Plateau, but it is getting exceedingly scarce, largely due to the early settlers shooting them and driving them away into more remote brushes.

Corvus caelae. Crow. The only chance I had of examining a bird here was one that had been shot, the down and proximal part of neck and body and feathers of which were pure white. Probably *Corvus coronoides* (The Raven) may be here too, though neither is common.

Strepera graculina. Pied Bell Magpie. One of the commonest birds here, feeding in the brushes on native fruits, and doing a fair amount of damage to orchard fruit. It is insectivorous, and at times carnivorous, feeding in company with the Black-backed Magpie, on scraps of meat thrown out.

Cracticus torquatus. Grey Butcher Bird. Common, and seen mostly in the open country, especially during autumn and winter.

Gymnorhina tibicen. Black-backed Magpie. This has become quite numerous here, but only since clearing has taken place. Old inhabitants have informed me that it was unknown here before the brushes were cleared. It is quite a usual thing to see as many as 30 or 40 together. One of its favourite foods is the large Cockchafer Beetle larva, which it digs out of the ground with its bill.

Introduced.

Sturnus vulgaris. Starling. The only introduced bird here and beginning to get numerous, and seen in large flocks. As we see it here, it is decidedly beneficial, feeding in the open land and living largely upon grasshoppers and other ground insects. It does not attack orchard fruit here and keeps well away from dwellings.

Curiously enough *Passer domesticus* (the English Sparrow) has not yet made its appearance here up to the time of writing (July 25th, 1925). This is rather remarkable, seeing how ubiquitous it is. This is the only town and district that I think I have visited in New South Wales where I have not met with it. This is probably due to the remoteness of this place in mountainous country, well off the railway. In the neighbouring towns on the coast such as Taree and Wingham, it is plentiful, and I saw it once close up to the foot of the Plateau.

MAMMALIA—MONOTREMATA.

Ornithorhynchus anatinus. Platypus. I have seen this here several times, though I don't think it is very plentiful, probably much less so now than when the early settlers arrived, as many have been shot. It enjoys a fair degree of protection at present.

Tachyglossus aculeatus. Echidna. Commonly called Porcupine. Not common. I have only seen one, and that was in heavy brush at the edge of the Plateau.

MARSUPIALIA.

Perameles obesula. Short-nosed Bandicoot. Fairly common in outlying parts of the Plateau, where it is less disturbed.

Perameles nasuta. Long-nosed Bandicoot. I have been told this animal has been seen here, though I have not met with it myself.

Dasyurus maculatus. Tiger Cat. This has been seen on the outskirts of the Plateau, but it appears to be rather uncommon.

The Common Native Cat (*D. viverrinus*) is said to inhabit the country at the base of the Plateau, but is unknown or very rare on the summit.

Phascologale penicillata. Native Weasel. An animal which, from its description, I take to be this species, was trapped some time ago. I have never seen it here, and it appears to be very rare anywhere now, though quite a common species about Sydney in the early colonial days. It is very similar to the common opossum in colouration, having a grey fur with black bushy tail for the distal two-thirds of its length, which, however, is not prehensile. In general form and shape of head it resembles the Native Cat. This is the largest of the so-called "Pouched Mice," other species of which I have not met with nor heard of as having been seen here.

Acrobates pygmaeus. Pygmy Flying Squirrel or Flying Mouse. This is evidently a rare species. I only know of its having been seen once.

Petaurus sciureus. Sugar Squirrel. One of the small flying opossums. Fairly common on the outskirts and like all these nocturnal animals much more numerous than they appear to be since they live in hollows by day and only move about after dark.

Petauroides volans. Large Flying Squirrel or Flying Opossum. This species is almost as large as the common opossum with a tail much longer in proportion and bushy. Probably fairly common.

Pseudochirus peregrinus. Ringtailed Opossum. Said to be fairly numerous in the brushes. I have not met with it, nor have I seen the nests. It is more common in the outlying brushes. It is capable of springing long distances from one tree top to another.

Trichosurus vulpecula. Common Opossum. This is fairly plentiful amongst the Eucalypt timber on the outskirts of the Plateau, but not seen about the brushes.

Trichosurus caninus. Shorteared Opossum. This is an inhabitant of the brushes and approaching the Black Opossum of Tasmania in color and general appearance, but differing in the shorter ears. Only seen occasionally in the outlying brushes.

Phascolarctus cinereus. Native Bear or Koala. Very rare here now and only inhabiting the Eucalypt timber at the edge of the Plateau. I have only seen one.

There appear to be only two wallabies:—

Macropus sp. Brush Wallaby, with dark reddish fur, a specimen of which



Rough Map of the Comboyne Plateau.

Scale about $\frac{3}{8}$ inch to 1 mile.

Block kindly lent by the Linnean Society of N.S.W.

I have not been able to obtain for identification purposes, though I have seen it in the distance. It is a medium sized animal.

Macropus wilcoxi. Pademelon or Red Legged Wallaby. This species inhabits the brushes and is very common.

Aepyprymnus rufescens. Kangaroo Rat or Rufous Rat Kangaroo. Not here now, but I am informed by an early settler that years ago they were a great pest to the farmers, and had to be persistently poisoned. This animal appears to be fast becoming extinct, probably largely due to the depredations of the fox, as living their daylight hours in a nest on the ground they become an easy prey for this animal. I am indebted to Mr. Howard Smith, a very reliable observer and an old resident of the Plateau, and also to Mr. Thomas Jones, one of the original early pioneers, for much of the information about the Marsupials, and to the latter, especially, for forms that existed here in the early days of settlement, but which have since disappeared.

Phascogale flavipes. Yellow-footed Pouched Mouse. Fairly common.

CHEIROPTERA.

The *Microcheiroptera* (Insectivorous Bats) are fairly numerous, probably represented by several species, which I have had no opportunity of identifying.

Pteropus poliocephalus. Flying Fox. A member of the suborder Megachiroptera or Fruit Bats. This is fairly plentiful in some seasons, feeding largely on the brush fruits, the native fig being one of its favourite foods, and doing great damage to orchard fruit.

RODENTIA.

Hydromys chrysogaster. Water Rat. This is the only native member of the family Muridae that occurs here and apparently was much more plentiful in days gone by.

CARNIVORA.

Canis dingo. Dingo. Fairly plentiful at the outskirts of the Plateau and about the rough country of the mountain sides. At times several may be seen together. Not appearing in the more cleared portions of the central parts.

Introduced.

RODENTIA.

Lepus cuniculus. Rabbit. Beginning to get a hold here and quite numerous in certain parts of the Plateau, and quite common in the centre in the cleared areas.

Epmys norvegicus. Grey Rat. I have only seen this rarely, though it may be common in certain parts.

Mus rattus. Black Rat. This is quite a common species in the brushes, though seen also about buildings, especially barns where there is grain.

Mus musculus. Mouse. Numerous at times. During the earlier half of this year (1925) there was almost a plague of them.

CARNIVORA.

Vulpes vulgaris. Fox. This animal is fighting hard to get a hold here and seems to be slowly succeeding. It has the Dingo as a competitor, but its worst enemy is the brush tick, which is holding it up in the brush country. It appears to be very vulnerable to this Acareid at present, but it is only a matter of time before it will acquire complete immunity. This is the deadly foe of the ground living birds. The Lyre Bird, Swamp Pheasant (Coucal) and Brush-Turkey are doomed to disappear in the near future from this coastal country, through the agency of this animal.

NATURAL HISTORY ERRORS.

Ida M. Mellen, Aquarist to the New York Zoological Society, contributes a note to the Society's "Bulletin" on the prevalence and perpetuation of Natural History errors. She takes as her text an extract from the Boonville *Republican*: "Nothing is more gratifying than to make a mistake and then see it copied without credit by all the other newspapers in the same country." She details some of the popular errors, such as the existence of polar bears and walrus in the Antarctic (penguins in the Arctic might have been cited as a parallel error), the pilot-fish "signalling the time and direction for the shark to dart at its victim," the assertion that a whale is a fish, and other inaccuracies that have a habit of cropping up at irregular intervals. Curiously enough, in the same paper the same author writes on the Walking Fish (*Periophthalmus*) which "is not discommoded by a sojourn of five or six hours among the roots of the mango trees, on which, as the accompanying illustration shows, it is in the habit of 'roosting.'" "Mangrove" trees grow on the mudflats and their roots are washed by the tidal waters. "Mango" trees are essentially inshore dwellers. The origin of this error can probably be traced to the stenographer or the compositor, but it should not have escaped the proof-reader!

A MONOGRAPH OF THE AUSTRALIAN LORICATES.

(Phylum MOLLUSCA—Order LORICATA.)

By TOM IREDALE and A. F. BASSET HULL.

V.

Family CRYPTOCONCHIDAE.

This, and the next Family—*Cryptoplacidae*—are very closely related, and indeed have been merged into one by Thiele; but as the members of the latter are well differentiated and are common characteristic Australian forms, we retain the two. The two families together constitute a remarkable section of the Order, and might even be regarded as a primary subdivision, a very notable feature being the scant slitting of the anterior valve. The slits vary from none to five, every other group having more than eight (with the exception of *Schizochiton*, which has six, but is obviously descended from an eight-slit form). In addition the tegmentum shows throughout a tendency to reduction, and the articulation appears as sidewings, but no reduction generally in the size of the shell takes place. In the family *Cryptoplacidae* the shell itself diminishes so that in some cases it is almost lost. The variation in the slitting of the posterior valve of the *Cryptoconchidae* is also noteworthy as the range is from some six to none, but only in one section does the insertion plate itself diminish.

The species are mostly small; are not uncommon, and are individually variable. They occur chiefly between tide marks, but are not so gregarious as some *Ischnochitons*, e.g., *Ischnoradsia*, but appear to be more solitary. Many species occur in southern waters, but the family is also found in tropical waters where, however, the *Cryptoplacidae* is more peculiarly represented.

The sculpture of the *Cryptoconchidae* consists of nodules, more or less elongated, and in many species the lateral and central areas show no differentiation, while the dorsal area is only indicated by a slight change of sculpture. No linear series can be arranged so as to suggest the evolution of the species, as the variation has been in every direction, and the species showing the most highly developed superficial sculpture—an important item in a group with such generalised ornamentation—has the most primitive (many slit) tail valve. This occurs in more instances than one, and even in the genus from which the family takes its name.* Contrariwise, the species showing the most specialisation as to the tail valve shows a superficial sculpture and form inseparable from other species with a generalised tail valve.

**Cryptoconchus*.—One of the most abnormal Loricates, the animal being very large, with a huge leathery girdle enclosing a large shell of which practically only the dorsal area is exposed. *C. porosus* was long regarded as a unique example of the genus, but Nierstrasz has recently named a second species from the Moluccas, a peculiar case of discontinuous distribution, as the original species is confined to New Zealand.

From the above it will be gathered that "Acanthochitons" are difficult to indicate by positive characters of high value, the anterior valve few-slit, generally five; the median valves one-slit, rarely none; the tail valve many to none; the plate sometimes degenerating into a callus.

The number of species is not yet satisfactorily determined, as several have been described from single specimens, and the extent of individual variation in species is not yet well known. Nor are the groups clearly distinguished, the best marked, as more material is secured, showing intermediate forms. At present an artificial key can be provided by means of the tail valve, supported by superficial sculpture, the radula being available only in connection with the higher groupings, and the gills being invariably short.

This artificial separative scheme is as follows:—

Posterior valve two-slit, sometimes showing interslitting, in some cases the slits becoming obsolete:

Insertion plate directed backward *Acanthochiton*.

Posterior valve many-slit:

Anterior valve five-ribbed *Notoplax*.

Anterior valve without ribbing:

Insertion plates large:

Sculpture of linear ridges only *Glyptelasma*.

Posterior valve with insertion plate short, many-slit, like that of an *Isechnochiton*, becoming callused with age *Craspedoplax*.

Anterior and median insertion plates long:

Girdle anteriorly produced *Craspedochiton*.

All valves unslit; tegmentum small; girdle leathery *Chorioplax*.

Genus ACANTHOCHITON.

Acanthochitona Gray, London Medical Repository, xv., 1821, 234. Type by monotypy *Chiton fascicularis* Linn.

Acanthochites Risso, Hist. Nat. l'Eur. Merid., iv., 1826, 268. Type by virtual tautonymy *A. communis* Risso = *C. fascicularis* Linn.

Phakellopleura Guilding, Zool. Journ., v., 1830, 28. Type by monotypy *Chiton fascicularis* Sowerby.

Hamachiton Middendorf, Mem. Sci. Nat. Imp. Sci. St. Petersburg., vi., 1848, 83-98. Type by present designation *Chiton fascicularis* Linn.

Platysemus Middendorf, Mem. Sci. Nat. Imp. Sci. St. Petersburg., vi., 1848, 83-98. Type by present designation *Chiton fascicularis* Linn.

Stectoplax Dall, Proc. U.S. Nat. Mus., iv., 1882, 284, 288. Type by monotypy *Stectoplax porrecta* Cpr. (Japan).

Anisochiton Fischer, Manuel de Conch., 1885, 881. Type by present designation *Chiton fascicularis* Linn.

Shells small, elongate; pustulose sculpture; lateral and central areas not differentiated; no radial ribbing on anterior or posterior valves; latter normal to small; insertion plates and sutural laminae very large; usually five, rarely three slits in anterior valve, slits sometimes obsolete; median valves one-slit, rarely unslit; posterior valve with large insertion plate, one slit on each side; girdle leathery, more or less covered with delicate or strong spicules, notably bunched and larger at the sutures, though apparently missing in some species when the shell is dried.

In the group as here utilised several sections can be noted, and it is possible

that these should be regarded as distinct genera. They can be indicated as follows:—

Posterior valve two-slit only:

Girdle delicately spiculose:

Tufts large, siliceous:

Dorsal area wedge-shaped series of *granostriatus*.

Girdle coarsely spiculose:

Tufts coarse series of *coxi*.

Girdle leathery:

Tufts asbestoid in pockets, visible on underside of girdle

. series of *sueurii*.

Girdle finely spiculose, tufts large:

Dorsal area linear:

Insertion plate of posterior valve not sinuate *pilsbryi*.

Posterior valve with two side slits, interslit

. . . series of *wilsoni*, *crocodilus*, *curiosus*, *sphenorhynchus*, and *aenigma*.

This section can be separated into two groups, very different at sight, though technically small separative characters only can be cited; the girdle tufts in one case disappearing in the dried shell, though noticeable in life; in the other the tufts remaining prominent when dried.

The species of this genus can, in most cases, be further grouped in series, the superficial appearance being generally similar and the differences being found in details of sculpture, colour of shell and spicules or tufts, dimensions, and habitat. So much of the authors' descriptions is mere repetition that we here give a general diagnosis of the main features of a series, limiting the text relating to the individual species to the synonymy, the differential details of sculpture, etc., and the distribution.

(i.). Series of *A. granostriatus*.

Shells medium, elongate, semi-carinated. Colour variable within limits of ochraceous to brown, dull greenish-grey or whitish, in some instances enlivened with bright orange-yellow, very rarely showing reds or blues, and then only on beaks of one or two valves. Exposed portion of valves in living examples barely one-fourth of total width, in dried specimens the girdle shrinks to less than one-half, leaving the exposed portion of the valves equal to the width of the girdle on both sides. The sculpture is composed of pustules, elongate, oval, or circular; concave, flat, or slightly convex. The anterior valve is either five-waved, or rounded without visible undulations. There is no differentiation between the lateral and central areas of the median valves, which have a distinct wedge-shaped jugal area terminating posteriorly in a pronounced beak, and this area is of varied sculpture. The posterior valve has the mucro post-central, and the post-mucronal area is more or less concave. The girdle is densely clothed with minute spicules, varying in colour with the species; the sutural tufts are disproportionately large (as compared with other members of the family) and also vary in colour. The interior features comprise varying colours; a squared and minutely crenulated sinus; long insertion plates; slits 5-1-2, and the insertion plate of the posterior valve has the slits on each side, and the plate between these slits is sinuated,

ACANTHOCHITON GRANOSTRIATUS.

(Plate ix., figs. 5-9.)

Acanthochites granostriatus Pilsbry, Nautilus, viii., 1894, 119. Port Jackson and Port Hacking, N.S.W. Type in coll. Acad. Nat. Sci. Philad. Pilsbry, Proc.

Acad. Nat. Sci. Philad., 1894, 81, pl. ii., f. 1-6, pl. iv., f. 37.

Acanthochites tatei Torr & Ashby, Trans. Roy. Soc. S. Aust., xxii., 1898, 219, pl. vii., f. 7. Encounter Bay, South Australia. Type in coll. Torr.

Acanthochiton granostriatus May, Illus. Index Tas. Shells, 1923, pl. xv., f. 13.

Colour brown to bluish-grey, with bright yellow markings, brilliant when alive, subdued when dried.

Anterior valve rounded, covered with oval flattened pustules which are flat topped; five low rounded undulations.

Median valves with lateral and central areas similarly pustulose; dorsal area trigonal, smooth, though colour lines are seen, suggesting grooves.

Posterior valve large, with mucro post-central, elevated; postmucronal area a little concave below the mucro, a small triangular smooth area extending to mucro; rest of valve pustulose.

Girdle densely minutely spiculose; large sutural tufts present, dull olive-green or brown.

Interior pink, stained darker in the middle of the cavity (Pilsbry). Most examples examined by us have a dark green interior.

Dimensions: 9 x 3½ mm. (Type), 10 x 7 mm. (Co-type in spirit). We have examples of dried shells measuring 17 x 7 mm.

Station: Under stones, commonly between tide marks, though occurring also below low water mark.

Habitat: New South Wales (type locality), South Queensland, Victoria, South Australia, North Tasmania.

Remarks: This shell is easily distinguished by its delicate appearance and beautiful colouration. The waves in the anterior valve are a noticeable feature, while the spicules are slender and generally pale greenish in colour. The pustules are oval, flattened, with flat tops, and are fairly crowded. The dorsal area is smooth.

Geographical variation is not marked, and we have been unable to distinguish subspecies. The name *tatei* was given to a shell supposed to be new by Torr and Ashby, but which the authors now regard as identical with *granostriatus*; in case series may prove the South Australian form separable the name is available.

ACANTHOCHITON BEDNALLI.

(Plate ix., figs. 1-4.)

Acanthochites bednalli Pilsbry, Proc. Acad. Nat. Sci. Philad., 1894, 81, pl. ii., f. 7-11. Gulf St. Vincent, South Australia. Type in coll. Acad. Nat. Sci. Philad.

Acanthochiton bednalli var. *johnstoni* Ashby, Trans. Roy. Soc. S. Aust., xlvii., 1923, 231, f. Carnarvon, Western Australia. Type in coll. Ashby.

Acanthochiton bednalli May, Illus. Index Tas. Shells, 1923, pl. xv., f. 12.

Colour sombre, dull grey and white.

Anterior valve rounded, covered with minute rounded oval pustules which are flat topped; no undulations or elevations present.

Median valves with lateral and central areas sculptured as anterior valve; dorsal area longitudinally striate; the seventh valve shows a faint ridge separating the lateral and central areas.

Posterior valve with small triangular striate area reaching to the mucro,

which is situated at about the posterior four-fifths; the remainder of the valve pustulose; post-mucronal area not concave.

Girdle having large green sutural tufts.

Interior: Variable from white to green.

Dimensions: 13 x 6½ mm. (Type, dry). Average dry examples, 26 x 12 mm.

Station: Between tide marks, under stones.

Habitat: South Australia (Sultana Bay example described), Victoria, Tasmania.

Remarks: This shell is separable from *A. granostriatus* by its coarser appearance, duller coloration, lack of waving in the anterior valve, and the coarse green spicules of the sutural tufts. The main differential feature is the sculpture of the dorsal area, fine longitudinal sulci being present, whereas in *granostriatus* this portion of the shell is smooth. This character requires careful verification as the smooth shell is coloured with longitudinal lines which look like sulci, and the shell must be closely examined by reflected light to determine this sculpture. Variation in the breadth of the jugal area is also present, and it is suggested that this may be a sexual feature.

Geographical variation has not been determined, as though Ashby named a Western Australian form (*johnstoni*) he gave no differential features from *granostriatus*, while placing the shells examined as a variety of *bednalli*. Until specimens are re-examined we leave Ashby's variety where he placed it. Specimens from southern Tasmania show variation in the breadth of the dorsal areas, and also in the form of the pustules, but we have not discerned any constant features.

ACANTHOCHITON MACROCYSTIALIS.

(Plate ix., figs. 20-23.)

Acanthochiton macrocystialis Ashby, Trans. Roy. Soc. S. Aust., xlviii., 1924, 324, pl. xxxi., f. 3 a, b, c. Port Arthur, South Tasmania. Type in coll. Ashby.

This recently described species is compared with *granostriatus*, *bednalli*, and *gatliffi*, but the diagnostic features are not satisfactory, while the figures provided are not much more helpful. According to the description this species has a smooth jugal area, broader than in *granostriatus* or *bednalli*, while the granules are intermediate in size between those of the two compared species, a physical impossibility as each varies; further those of *macrocystialis* are "often pointed" while those of *bednalli* are "bluntly obovate," but the type of the latter has the granules "pointed." Such descriptions are difficult to understand, and the species named still more difficult to comprehend. The girdle is described as spiculate, whereas that of *gatliffi* is spongy. Ashby gives "slits 4—0—1—3," but the normal formula is 5—1—2.

Ashby regards the "habitat of this species (within kelp-roots) as constituting a discovery of exceptional interest," but this station has been well known in connection with Neo-Zelanic species for over fifty years, and it was through this fact that the late Mr. W. L. May discovered this species, being incited to search the station by Iredale's constant urging.

ACANTHOCHITON THACKWAYI.

(Plate ix., figs. 10-11.)

Acanthochiton thackwayi Ashby, Trans. Roy. Soc. S. Aust., xlviii., 1924, 318, pl. xxxi., f. 1, 2. Fly Point, Port Stephens, New South Wales. Type in coll. Ashby.

Another recently described species, the status of which is better fixed, and through study of one of Thackway's original specimens we find that this is a definite form apparently representing *bednalli* in New South Wales waters. The general appearance recalls that of *bednalli*, but the pustules are circular and convex and more separated than in the southern species, while the smooth dorsal area is characteristic of *granostriatus*. Anterior valve obscurely five-waved; tufts large, greenish-white; interior greenish-white. Ashby does not give the internal features, while his measurements are 9×4.5 , including the hair tufts; shell itself only 7×4.5 . The dimensions of Thackway's specimen are 8×4 , while Hull has specimens collected at Shellharbour, N.S.W., measuring 11×6 mm.

Habitat: Port Stephens and Narrabeen (Thackway), Port Jackson (Hull), Shellharbour (McAndrew), New South Wales.

ACANTHOCHITON GATLIFFI.

(Plate ix., figs. 24-25.)

Acanthochiton gatliffi Ashby, Trans. Roy. Soc. S. Aust., xliii., 1919, 398, pl. xlii., f. 2-5. Port Lincoln, South Australia. Type in coll. Ashby. May, Illus. Index Tas. Shells, 1923, pl. xv., f. 15.

This species was described from a shell measuring $5 \times 2\frac{1}{2}$ mm., taken at Port Lincoln, South Australia. Mr. C. J. Gabriel has furnished us with a specimen measuring 8×4 mm., dredged in 8 fath., off Point Cook, Port Phillip, Victoria, and determined by the author. Judging from this example, which we figure, the species is easily separable by its very coarse sculpture, the lined and posteriorly pitted dorsal area. The anterior valve has the pustules somewhat convex and circular, but in the latero-pleural areas the pustules are more elongate ovals, arranged linearly near the jugum, radially towards the lateral edge; the jugum is pitted; the posterior valve has the mucro more elevated, the post-mucronal slope steeper than *granostriatus*.

The girdle tufts are large, like those of *bednalli*, the spicules bluish-white; girdle probably wide with minute scale-like spicules present. Compared with Ashby's description the rays on the anterior valve are obscure. There appear to be only three slits. Ashby writes five and figures four. The side slits are obscure.

Habitat: Port Lincoln, S.A. (Type) Port Phillip, Victoria (Gatliff and Gabriel). Tasmania (May).

ACANTHOCHITON SHIRLEYI.

(Plate ix., figs. 16-19.)

Acanthochiton shirleyi Ashby, Trans. Roy. Soc. S. Aust., xlv., 1922, 13, pl. iii., f. 2 a-c. Northwest Reef, Capricorn Group, Queensland. Type in coll. Ashby.

The sculpture of this shell consists of small, flat, circular pustules; the posterior valve with suboval tegmentum, the mucro posterior and planate but terminal. The interior characters are peculiar, the anterior insertion plate being much produced; the seventh valve (figured) with tegmentum elongate, almost parallel sided, the sutural plates large, the sutural laminae produced forward triangularly with a wide sinus; the insertion plates of the posterior valve showing triangular sutural laminae winged laterally, posteriorly perpendicularly lengthened, two-slit and sinuate.

Dimensions: 11×5 mm. (curled).

Habitat: Queensland, all along the Great Barrier Reef.

Remarks: Specimens sent by Dr. Shirley to Iredale were not named on account of their defective condition. Ashby has described these shells, naming the species in honour of the collector. The surface was greatly eroded, and the author's characters are partly based on this feature. The species appears to be the coral reef representative of the *bednalli* series, as Hedley has collected it at various points on the Great Barrier Reef.

ACANTHOCHITON COMPLANATUS.

(Plate ix., figs. 12-15.)

Acanthochiton complanatus Hull, Proc. Roy. Soc. Queensland, xxxvi., 1924, 112, pl. xxi., f. 2 a-c. North Queensland. Type in Queensland Museum.

This is the Queensland mainland representative of *granostriatus* and agrees in colouration and style with that species, but the pustules are circular and flattened, and the dorsal area is only smooth anteriorly, broken and semi-pustulose towards the beaks of the valves. It differs from *shirleyi* at sight in the more numerous and more crowded pustulation, in its elevation, and its much finer spiculose bunches; the interior is bluish-white.

Dimensions: 15 x 8 mm. (Type).

Station: Under small stones embedded in coral sand.

Habitat: Magnetic Island, off Townsville, North Head and Stone Island, Port Denison, Howick I. (north of Cooktown), and Thursday I., Queensland.

(ii.). ACANTHOCHITON COXI.

(a). ACANTHOCHITON COXI COXI.

(Plate ix., figs. 26-30.)

Acanthochites coxi Pilsbry, Nautilus, vii., Feb., 1894, 119. Port Jackson, New South Wales. Type in coll. Acad. Nat. Sci. Philad. Proc. Acad. Nat. Sci. Philad., May, 1894, 80, pl. iii., f. 21-26, pl. iv., f. 34.

Acanthochiton coxi Ashby, Trans. Roy. Soc. S. Aust., xlv., 1922, 18 (from Balmoral, North Borneo!).

Shell large, a little elevated, elongate, semi-carinated. Colour dark greenish, maculated with white or yellow.

Anterior valve semicircular, covered with elongate pear-shaped pustules, convex, closely packed but not overlapping; no radial ribbing.

Median valves with narrow, almost linear dorsal area, longitudinally grooved; latero-pleural areas closely packed with elongate convex pustules radiating from the beak; pleural area not differentiated but pustules smaller and still more crowded.

Posterior valve large; mucro post-central; ante-mucronal area wedge-shaped, narrow, grooved on each side and having longitudinal rows of elongate pustules; remainder of valve with similar smaller pustules radially arranged.

Girdle densely very coarsely spiculose, spicules broad at base and rapidly tapering; large tufts of longer spicules at sutures.

Interior: Pink (Pilsbry), but examples are frequently met with in which there is no trace of this colour, and most of the Shellharbour examples have a greenish interior. The insertion plates of the anterior valve are very long, and of the median valves large; the posterior valve is sinuate between the slits, sometimes with interslitting; slits 5—1—2.

Dimensions: 33 x 12 mm. (Type). Paratype in spirit, 23 x 13 mm.

Station: Under or at the edge of insertion of stones in sandy or muddy

situations.

Habitat: New South Wales. (Type locality: Port Hacking, N.S.W., specimens described, Balmoral, Middle Harbour, Port Jackson). Bulli, Shellharbour, etc., N.S.W.

Remarks: This is a strikingly handsome shell when well-preserved, the pear or tear-shaped (May & Torr's *lachrymosus*) pustules furnishing a very well marked character. It prefers sheltered situations such as harbours and almost landlocked bays. McAndrew has taken a very fine series at Shellharbour, N.S.W., where the rock is sandstone, numerous fragments of which are embedded in muddy sand.

(b). *ACANTHOCHITON COXI LACHRYMOSUS*.

(Plate ix., figs. 27-29.)

Acanthochites lachrymosus May & Torr, Pap. & Proc. Roy. Soc. Tas., 1912, 36, pl. i., f. 1-4. Frederick Henry Bay, Tasmania. Type in Tasmanian Museum.
Acanthochiton coxi May, Illus. Index Tas. Shells, 1923, pl. xvi, f. 1.

The south Tasmanian shells have the tear-shaped drops more confused and overlapping, while the Victorian ones from Portland (C. J. Gabriel) have the drops smaller and separated. The girdle spicules of all the southern shells are smaller and more delicate than those of the northern ones. Undoubtedly the two forms are subspecifically distinct.

Dimensions: 34 x 12½ mm.

Habitat: Victoria, Tasmania.

(iii.). Series of *A. sueurii*.

ACANTHOCHITON SUEURII.

(Plate x., figs. 1-4.)

Chiton sueurii Blainville, Dict. Sci. Nat., xxxvi., 1825, 553. King George Sound, South-west Australia. Type in Paris Museum.

Chiton (Acanthochiton) asbestoides E. A. Smith, Zool. Coll. Alert, 1884, 83, pl. vi., f. 6. Flinders Island, Bass Strait. Type in Brit. Mus.

Acanthochites asbestoides Pilsbry, Man. Conch., xv., 1893, 17, pl. 2, f. 55. Proc. Acad. Nat. Sci. Philad., 1894, 79, pl. iii., f. 16-20.

Acanthochiton sueurii May, Illus. Index Tas. Shells, 1923, pl. xvi., f. 3.

Shell medium to large, depressed, semi-carinated. Colour black or bluish-slate, sometimes white.

Anterior valve rounded, with faint indication of ribbing, covered with small oval pustules.

Median valves similarly sculptured, pustules smaller on dorsal area, which is not differentiated, but the lateral areas are a little raised; valve ii. is longer than the others.

Posterior valve very small; mucro post-central; post-mucronal area sloping, protractive, pustulose throughout.

Girdle leathery, broad, having long asbestoid golden or silvery tufts, the bases of which are distinctly visible on the under side of the girdle.

Interior: Deep blue; slits 5—1—2.

Dimensions: 25 x 15 mm. (Tasmania).

Station: Under or at the edge of insertion, occasionally on the upper surface of stones embedded in sand, from median to below low tide mark.

Habitat: Western Australia (King George Sound example described), South Australia, Victoria, Tasmania.

Remarks: This is a very common shell in Queen Charlotte Sound, Western Australia, nearly every example being much eroded. King Island, Bass Strait, examples are generally larger, and less eroded. Shells from the latter locality also have a smoother dorsal area; the pustules are larger and rounded towards the edge.

ACANTHOCHITON KIMBERI.

(Plate x., figs. 5-12.)

Acanthochites kimberi Torr, Trans. Roy. Soc. S. Aust., xxxvi., 1913, 167, pl. vi., f. 5 a-f. Kangaroo Island, South Australia. Type in coll. Torr.

Acanthochiton kimberi May, Illus. Index Tas. Shells, 1923, pl. xv., f. 16.

Acanthochiton maxillaris Ashby, Trans. Roy. Soc. S. Aust., xliii., 1919, 397, pl. xli., figs. 5-6; pl. xlii., f. 1. Marino, South Australia. Type in coll. Ashby.

Shell medium to small, elongate, depressed. Colour purple-brown, varied with pale yellow.

Anterior valve pustulose, undulated, not ribbed; apex almost smooth; pustules increasing in size and becoming elongate towards the edge, where they are rather separate; the pustules are convex-topped ovals.

Median valves with latero-central areas pustulose as anterior valve; dorsal area narrow, triangular, with small longitudinal cuts and thus separated from the latero-central areas, but with no separative line.

Posterior valve small, mucro central; post-mucronal area sloping; ante-mucronal wedge small, sculpture as in median valve but less elongate pustules.

Girdle wide, leathery; sutural tufts long, asbestoid.

Interior greenish to bluish; slits variable.

Dimensions: 10 x 4 mm. (Type), 15 x 6 mm. (maximum measured).

Station: Under stones between tide marks.

Habitat: South Australia, Victoria, Tasmania, New South Wales (Port Jackson example described).

Remarks: Described from Aldinga, South Australia, by Torr, the sculpture is said to be of fine, fairly numerous pustules. The anterior valve has three slits in the insertion plate which is fairly long; one slit on each side of the median valves, and two side slits in the posterior valve which has the insertion plate directed backwards. The asbestoid tufts are noted, and three "sharply defined" riblets on the anterior valve. New South Wales shells agree generally, but present some peculiarities which render it difficult to decide as to their exact status. The sculpture varies a little from that described by Torr, the pustules being as given in our description. The interior features vary so that while the anterior insertion plate is generally three-slit the slits become insignificant and even obsolete, and the median valves are generally unslit. The posterior valve commonly shows two slits but sometimes these are obsolete, so that a shell with the slit formula 0-0-0 is possible. Moreover, interslitting may occur in this valve, while sometimes the seventh valve, rarely the sixth, has one slit on each side though the others are unslit. A series of figures are given to elucidate these features.

We have placed *A. maxillaris* Ashby here, as the description only lays stress upon "a row of exceptionally large milk-white pustules," and the other features suggest this species.

ACANTHOCHITON DELICIOSUS.

(Plate x., fig. 6.)

Acanthochites deliciosus Thiele, Die Fauna Sud-west Aust., iii., 1911, 403. Bunbury, South-west Australia. Type in Berlin Mus.

This species, described from Koombane Bay, South-west Australia, from a very small, probably young, shell, belongs to the *kimberi* series. The sculpture is of coarse granules, the asbestoid girdle tufts characteristic, and the slitting ?—1—2, the anterior valve apparently not having been disarticulated. Examples were collected by Hull at Woody Island, Recherche Archipelago, and King George's Sound, W.A.

The shell is a little less elongate than the normal *A. kimberi*; the pustules are elongate ovals radiating towards the edge; the jugal area is not differentiated but only pitted. Slits 3—1—2.

Dimensions: 3.5 x 1.75 mm. (Type).

Habitat: South-western Australia.

Thiele's figures are reproduced here, while a detailed painting of half of a median valve of one of Hull's specimens appears on plate x, fig. 6, showing very elongated pustules widely separated.

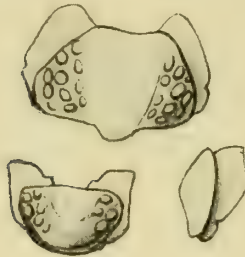


Fig. 1.
A. deliciosus.

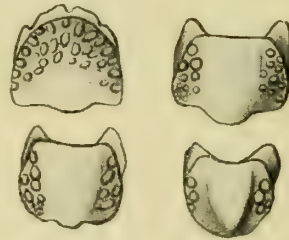


Fig. 2.
A. michaelsoni.

ACANTHOCHITON MICHAELSONI.

Cryptoplax michaelsoni Thiele, Die Fauna Sud-west Aust., iii., 1911, 404. Sharks Bay, West Australia. Type in Berlin Museum.

This species, described by Thiele under the genus name *Cryptoplax* on account of the lack of slitting of the insertion plates, is apparently the Western Australian representative of the *kimberi* degenerates of the East. Through a misapprehension of the description Ashby has "rediscovered" a *Cryptoplax*, 7 mm. long, from Carnarvon, Western Australia, to which he has applied Thiele's name. The Thielean figures here reproduced absolutely prove that Thiele's species is not a *Cryptoplax* in our usage of the genus. Thiele's shell is distinctly sculptured with small tubercles, the tegmentum similar to that of *Acanthochiton* generally, the dorsal area free from pustules, the mucro posterior, slitting three in the anterior valve only, no slits in the remaining valves. General colouration yellowish brown.

(iv.). ACANTHOCHITON PILSBRYI.

(Plate ix., figs. 31-35.)

Acanthochites pilsbryi Sykes, Proc. Malac. Soc., ii., 1896, 91, pl. vi., f. 6, 6a.

Port Phillip, Victoria. Type in Nat. Mus., Melbourne.

Acanthochites maughani Torr & Ashby, Trans. Roy. Soc. S. Aust., xxii., 1898, 218, pl. vii., f. 5. Port Victor, South Australia. Type in coll. Torr.

Hedley & Hull, Rec. Aust. Mus., vii., 1909, 265, pl. lxxiv., f. 24-27.

Acanthochiton pilsbryi Ashby, Trans. Roy. Soc. S. Aust., xliii., 1919, 394, pl. xli., f. 1-3.

Acanthochiton pilsbryi maughaneanus Ashby, id. ib., 395, pl. xli., f. 4. Middle Harbour, Sydney, N.S.W. Type in coll. Ashby.

Shell medium, elongate, depressed. Colour reddish fawn to brown, occasionally black.

Anterior valve pustulose, pustules elongate, convex, separate, longer towards edge; apex tending to smoothness, no ribbing present.

Median valves with dorsal area narrow, linear and smooth; transverse growth lines, latero-central areas pustulose, a faint elevation indicating their junction, the pustules on the former radially arranged, on the latter linear, the pustules oblique and touching each other.

Posterior valve large; mucro central; ante-mucronal band as dorsal; remainder of valve pustulose as anterior valve.

Girdle broad in life, contracting and curling when dry to less than one-fourth, covered with rather long spicules; sutural tufts small.

Interior: Bluish or pinkish. Insertion plate of posterior valve short, perpendicular, not sinuate; slits 5—1—2.

Dimensions: 10 x 3.5 mm. (Type).

Station: Under stones in muddy situations below median tide mark.

Habitat: New South Wales (Port Jackson specimen described), Victoria, South Australia, Tasmania.

Remarks: The variation in sculpture cannot be construed geographically, as extremes occur commonly in N.S.W. waters. Ashby has named the N.S.W. form, but none of his characters are constant, and the interior features do not differ at all. The shell, when alive, has a huge girdle which dries up more than that of any other species, consequently no idea of the living shell can be gained from the dried specimens commonly handled. Two figures are given, showing the differences in life and death.

(v.). Series of *A. wilsoni*.

ACANTHOCHITON WILSONI.

(Plate x., fig. 18.)

Acanthochites (Notoplax) wilsoni Sykes, Proc. Mal. Soc., ii., 1896, 92, pl. vi., f. 2, 2c. Port Phillip, Victoria. Type in Nat. Mus., Melbourne.

Acanthochites verconis Torr & Ashby, Trans. Roy. Soc. S. Aust., xxii., 1898, 217, pl. 7, f. 4. Gulf St. Vincent, South Australia. Type in coll. Torr.

Shell elevated, carinated, side-slopes convex. Colour (of the type) "the ridge marked with bands of reddish and salmon-pink; the lateral areas of a dark red; the pleural areas marked with red and white."

Described and figured by Sykes from Port Phillip, Victoria, the figures being untrustworthy, as in the case of *A. pilsbryi*, described at the same time, in which the pustules are said to be round, and there are no such pustules on the shell. In the present case "sculptured all over with well-marked flattened tubercles" is read and the figure shows these very small and crowded. The dorsal area is elongated, wedge-shaped, marked with both longitudinal and transverse striae. The posterior valve has an elevated and rather pointed mucro at about the posterior third.

Girdle large, densely spiculose. Sykes describes it as showing no visible tufts, but as in the case of its nearest ally *A. purpuratus*, the tufts are doubtless present, but are withdrawn and disappear as the girdle dries or even as it shrinks in alcohol.

Interior whitish, becoming stained with red under the jugal area. Slits 5—1—6.

Dimensions: 25 x 10 mm. (Type), 18 x 10 (figured example, dry and curled).

Station: Under stones below low water mark.

Habitat: Victoria (but not extending round Wilson's Promontory), South Australia.

Remarks: Our figure is of a specimen from McDonnell Bay, South Australia, which agrees well with the author's description, the granules being oval and flattened. Torr and Ashby described (1898) *A. verconis* from Gulf St. Vincent, dredged by Dr. Verco, a specimen 10 x 4 mm., with the pleural area covered with ten to eleven diagonal rows of squamose pustules, the dorsal area striated, the mucro central; slits 5—1—8. This has since been synonymised by the authors, but Hedley's figures of their type do not coincide with those provided by Sykes.

ACANTHOCHITON PURPURATUS.

(Plate x., figs. 15-17.)

Acanthochiton purpuratus Hull, Aust. Zool., iii., 1923, 196, pl. xxvii., f. 2. Betangabe Inlet, near Twofold Bay, New South Wales. Type in Australian Museum.

Superficially resembling *A. wilsoni*, but with the pustules round, convex, and separated; the dorsal area smooth; the posterior valve with the mucro elevated, posterior, and the post-mucronal area concave. Colour purplish-red (ochraceous, flecked with dull red).

Girdle very large, fleshy, dull purple, densely clothed with delicate spicules, and having large sutural tufts which generally disappear as the girdle dries.

Interior white, slits 5—1—10. Insertion plate of anterior valve very long, of median valves large, and of posterior valve large with two side slits, 8-slit between, slits small, but having a long deep groove running to the tegmentum; plate a little produced backward.

Dimensions: 18 x 11 mm. (Type, dried).

Station: Under stones, or in interstices of friable shale, in sheltered pools, below low water mark.

Habitat: New South Wales (Betangabe Inlet, Shellharbour, Port Jackson, and Long Reef, north of Sydney).

vi. Series of *A. crocodilus*.

ACANTHOCHITON CROCODILUS.

(a). ACANTHOCHITON CROCODILUS CROCODILUS.

Acanthochiton crocodilus Torr & Ashby, Trans. Roy. Soc. S. Aust., xxii., 1898, 216, pl. vi., f. 2. Marino, South Australia. Type in coll. Torr.

Shell medium, elongate, depressed. Colour pale olive-green.

Anterior valve strongly five-ribbed, sculptured with triangular pustules with the apices directed forward and outward, small at the apex of the valve, increasing in size towards the margin.

Median valves with broadly triangular dorsal area, each margin of which is deeply notched with three to eight notches; lateral areas distinctly raised with a strongly raised diagonal rib; latero-pleural areas covered with triangular pustules which become very flat and large as they approach the anterior margin.

Posterior valve with mucro median, ante-mucronal area smooth, post-mucronal area concave, sculptured similarly to median valves, but pustules much smaller.

Girdle broad, spongy, densely spiculate and edged with notable long spicules;

short, brownish.

Interior bluish-white; slits 5—1—6; anterior insertion plate long, median sutural laminae large, posterior insertion plate short, terminally perpendicular, thickened, two-slits interslit with three or four notches.

Dimensions: 17 x 8 mm. (Type) dried specimen.

Habitat: South Australia (Marino; Dr. Torr).

Remarks: The authors emphasise the strongly raised diagonal rib (which, however, is not clearly shown in the figure), the very coarse shagreening, and the microscopical striation of the pustules. Although we have not seen specimens from Victoria or Tasmania the range of the species probably extends throughout southern and south-eastern Australia. We separate the New South Wales shell as a subspecies.

(b). *ACANTHOCHITON CROCODILUS DEBILIOR*, n. sub. sp.

(Plate x., figs. 13, 14.)

Shell generally similar to the preceding, but with the anterior valve five-waved (not ribbed); the latero-pleural areas hardly separated, a diagonal rib being merely indicated; posterior valve with muero at posterior fourth; sutural tufts long and composed of large spicules. Colour variable, white with a few faint markings chiefly towards the beaks; uniform purple, and dark red are some of the variations observed.

Dimensions: 20.5 x 8.5 mm. (Dried example).

Station: On, under, or at the edge of insertion of stones in sand or mud, below low water mark.

Habitat: New South Wales (Port Jackson, and Shellharbour).

Remarks: This subspecies differs from the South Australian shell in the generally weaker sculpture, and the obsolescence of the ribs on anterior and median valves.

(vii.). *ACANTHOCHITON CURIOSUS*, n. sp.

(Plate x., figs. 24, 25.)

Shell broadly ovate, flattened. Colour grey-brown.

Sculpture of minute separate circular, convex pustules; dorsal area smooth; posterior valve with muero at about the posterior third, depressed, post-mueroal slope concave.

Girdle very wide, covered with very fine spicules; sutural tufts white, long, silky.

Interior bluish-white; anterior insertion plate very large, 5-slit; median insertion plates very wide, 1-slit; posterior valve with large sutural laminae, posteriorly 2-slit and irregularly 8-slit between where the plate is calloused and perpendicular.

Dimensions: 21 x 15 mm. (Dried shell).

Station: Under stones lying on dead coral reef at low tide.

Habitat: Armit Island, near Whitsunday Group, Queensland (Type) and other localities northward to Torres Strait. Type in Queensland Museum.

(viii.). *ACANTHOCHITON AENIGMA*, n. sp.

(Plate x., figs. 21, 23.)

Shell small, elongate, narrow, elevated, carinated. Colour pale fawn, mottled with reddish-brown.

Anterior valve faintly five-ribbed, the ribs bearing slightly elongate pustules, the sculpture otherwise consisting of circular, separate, convex granules.

Median valves rather elongate; dorsal area wedge-shaped, with margins dentate, smooth, but showing colour lines; latero-pleural areas covered with separated, suboval, convex granules, more massed laterally.

seven sutural tufts on each side and four around the anterior valve, spicules

Posterior valve with apex elevated at posterior third; post-mucronal slope concave, pustules more circular thereon.

Girdle densely finely spiculose, sutural tufts long.

Interior pinkish-white, centre of valves deep pink. Anterior valve with large insertion plate, obscurely five-slit; median valves with large sutural laminae sometimes unslit, valve vii. with 1—1 slits; posterior valve with sutural laminae and insertion plate produced backwards, four-slit, not sinuated.

Dimensions: 11 x 5 mm.

Station: Dredged in 70 fathoms.

Habitat: Off Ulladulla, New South Wales.

Remarks: This is the first fairly deepwater Loricata, other than Lepidopleurids, recorded from the coast of New South Wales. It was taken alive from a block of stone brought up in a trawl by C. W. Mulvey, of the trawling company. Type in the Australian Museum.

(ix.). *ACANTHOCHITON SPHENORHYNCHUS*, n. sp.

(Plate x., figs. 19, 20.)

Shell rather depressed, broadly oval, subcarinate, dorsal areas narrow. Colour greyish-white, painted with brown spots, blotches and streaks, and suffused jugally with lavender.

Anterior valve showing no undulations, covered with crowded, circular, flat-topped pustules.

Median valve with narrow jugal area, smooth, subcutaneously lined; latero-pleural areas not differentiated, densely pustulose, pustules circular, flat-topped.

Posterior valve with mucro at posterior fourth, post-mucronal slope straight.

The pustules vary a little from circular to oval, those on the post-mucronal area being circular, as are those on the lateral edge of the anterior valve; the remainder of the anterior valve pustules vary towards oval, some are concave, some flat-topped; on the latero-pleural areas those nearest the jugum are concave, while those on the pleural area are flat-topped.

Girdle wide, densely finely spiculose; sutural tufts notable.

Interior white, valves vii. and viii. having central purple spots. Anterior insertion plate large, with five distinct slits; median insertion plate large, 1-slit; posterior insertion plate large, projecting a little backward, 2-slit, sinuate, with seven teeth between slits.

Dimensions: 16 x 8½ mm.

Station: Under stones at low water.

Habitat: Hayman Island, near Port Denison (type) and other Queensland localities to Torres Strait.

Remarks: The type shell was collected by E. H. Rainford; and Hull collected several specimens at the other localities. Type in Queensland Museum.

Genus *METUROPLAX*.

Meturoplax Pilsbry, *Nautilus*, vii., 1894, 107. Type by original designation *Acanthochites retrojectus* Pilsbry.

Shell very small, sculpture pustulose, no dorsal area appreciably differentiated, although on that place the pustules are smaller and more crowded, the tail valve very small and insignificant, the mucro terminal and the post-mucronal area retractive, the girdle finely spiculose, the sutural tufts asbestoid and pocketed as in the series of *A. sueurii*; internally anterior valve regularly five-slit, median valves one-slit on each side, posterior valve with two side slits only, the insertion plate thrown strongly forward. Only one species is known, apparently a derivative of the *A. sueurii* group, but now well distinguished.

METUROPLAX RETROJECTA

(Plate x, figs. 26, 30.)

Acanthochites retrojectus Pilsbry, Nautilus, vii., Jan., 1894, 107. Port Jackson, New South Wales. Type in Acad. Nat. Sci. Philad. Pilsbry, Proc. Acad. Nat. Sci. Philad., May, 1894, 78, pl. ii., f. 12-15.

Acanthochiton retrojectus var. *pustulosus* Ashby, Trans. Roy. Soc. S. Aust., xli., 1922, 15. Quarantine Station, Sydney Harbour, N.S.W. Type in coll. Ashby.

Shell small, flattened, round-backed. Colour dark and light green, sometimes black, variously blotched and patched with colour.

Anterior valve rounded, not ribbed, covered with small rounded, separated, convex pustules.

Median valves with dorsal area not differentiated, latero-pleural areas similarly pustulose, pustules larger towards the edge. Although the dorsal area is not separated the pustules are smaller and oval, showing an indistinct trigonal area.

Posterior valve small, mucro elevated, posterior; post-mucronal area retractive, sculptured with minute pustules as on anterior edge, small ante-mucronal wedge showing dorsal sculpture.

Girdle downy, sutural tufts prominent, asbestoid, long and silky.

Interior dark green. Slits 5—1—2.

Dimensions: $9\frac{1}{2} \times 3\frac{1}{2}$ mm. (Type), 12 x 6 mm. (Paratype in spirit); average dry specimens, 11 x 5 mm.

Station: Generally on the surface of the littoral rocks below median tide mark, in crevices and frequently associated with *Galeolaria caespitosa*, where it accommodates itself to the convolutions of the vermiform shell and, becoming sedentary, suffers greatly from erosion. It is also found below low water mark in the interstices of clusters of the Tunicate "Cunjevoi," on the seaward side of the shore rocks.

Habitat: New South Wales (Port Jackson specimen described), Queensland, eastern Victoria.

Remarks: The sculpture of this shell is very variable amongst examples taken from the same locality; sometimes there are large separated pustules on the latero-pleural areas, in other cases the pustules are small and closely massed. Queensland shells are broader, more regularly pustulose, the pustules well marked on the dorsal area; there is a faint waving on the anterior valve; the posterior valve rather larger. (Examples taken by Hull on Facing Island, Port Curtis, Burnett Heads, and Cooktown, Queensland). Victorian examples show the posterior insertion plate striate between slits.

Genus NOTOPLAX.

Notoplax H. Adams, P.Z.S., 1861, 385. Type by monotypy *Cryptoplax* (*Notoplax*) *speciosa* H. Adams.

Macandrellus Dall, Proc. U.S. Nat. Mus. I., 1878, 299. Type by original designation *Acanthochites costatus* H. Adams & Angas.

? *Mecynoplax* Thiele, Gebiss das Schnecken (Troschel) II., 1892, 393. Type by monotypy *M. acutirostratus* = *Notoplax hilgendorfi* Thiele.

Loboplax Pilsbry, Nautilus vii., 1893, 32. Type by original designation *Chiton violaceus* Quoy & Gaimard.

Shells small to large, elongate oval, tegmentum small, girdle large; coloura-

tion brown to pale red. Sculpture bold, with more or less distinct radials separating the lateral from the pleural areas, and similar radials on end valves, sometimes obsolete, at others very prominent: dorsal area represented by a linear ridge, girdle always very broad, sometimes leathery with only sutural tufts present, while others are so densely spiculate that the sutural tufts are difficult to distinguish: insertion plates very large, posterior valve many slit.

The inclusion of *Macandrellus* and *Loboplax* as synonyms is necessary, as though the types of these groups look at first sight distinct, every gradation is found, so that the names cannot be utilised even in a sectional sense. The second Neozelanic species of "*Loboplax*" has a girdle like that of "*Macandrellus*," thought its specific distinction from *violaceus* is still in question. On the other hand immature specimens of true *Notoplax* can scarcely be differentiated from shells of "*Macandrellus*."

There is a tendency throughout the series of forward movement in the insertion plate of the posterior valve: this is clearly seen in the Australian *gabrielii*, more noticeable in the Lord Howe Island *leuconotus*, and exaggerated in the New Caledonian *tridacna*: the same movement is seen in members of the *speciosa* series, but the extremes have not yet been found.

It is somewhat difficult to express the differences in key form, but the characters may be abbreviated as follows:—

Girdle thickly spiculate:

- Spicules delicate like silk *speciosa*.
- Anterior valve ribbed *glauerti*.
- Pustules larger, girdle like plush *macandrewi*.
- Spicules coarse and glassy *subspeciosa*.

Girdle sparsely covered with spinelets, sutural tufts prominent:

- Dorsal area pitted *gabrielii*.
- smooth posteriorly pitted *subviridis*.
- smooth:
- General sculpture fine with fine radials *costata*.
- coarse with coarse radials *extra*.
- less coarse with bolder radials *rubrostrata*.

Series of *N. speciosa*.

Shell large, valves very narrow, elongate, girdle very broad, densely spiculate.

Colour varied, tegmentum of red brown varying to yellow or dark brown. Anterior valve small, semicircular, ribbed either prominently or ribs obsolete, pustulose.

Median valves with narrow smooth dorsal area, lateropleural areas generally separated by a ray of larger pustules which vary in size and shape.

Posterior valve large, mucro practically terminal, elevated, post-mucronal slope steep.

Girdle densely spiculate but spicules varying in size, and sutural tufts rarely prominent though generally distinguishable.

Interior varying from white to pink or green.

Insertion plates very large, those of anterior strongly thrown forward. median ones like wings, and that of posterior valve long and nearly perpendicular.

NOTOPLAX SPECIOSA.

(Pl. xii., fig. 3.)

Cryptoplax (*Notoplax*) *speciosa* H. Adams, P.Z.S., 1861, 385. Tasmania. Type in Brit. Mus.

Acanthochites (*Notoplax*) *speciosus* Pilsbry, Man. Cónch., xv., 1893, 32, pl. i., figs. 23-26 (from type). Proc. Acad. Nat. Sci. Philad., 1894, 83, pl. iv., figs. 31-33 (from St. Vincent Gulf, S.A.).

Acanthochiton (*Notoplax*) *spongialis* Ashby, Journ. Roy. Soc. West Austr., x., 1923, 13, pl. 1. D'Entrecasteaux Channel, South Tas. Type in coll. Ashby.

Acanthochiton speciosus May, Illustr. Index Tasm. Shells, 1923, pl. xvi., f. 2.

The large size and massive spiculose girdle make this species distinctive, the spicules being long, thin and delicate. The pustules on the anterior valve are round and flattopped, the radial ribbing being represented only by larger elongated pustules; similarly the pustules of the median valves are smaller and rounder towards the beaks, larger and more oval towards edges: the lateropleural rib is formed of larger semiconfluent oval pustules limiting a small lateral area. The posterior valve has no ribbing behind the muero. Interior pinkish white.

Dimensions: 72 x 24 mm. (Type): 38 x 18 mm., 42 x 21 mm.

Station: Dredged in shallow water, generally living in sponges.

Habitat: New South Wales, Victoria, Tasmania, South Australia.

Remarks: We figure a valve from shell sand Long Bay, New South Wales, which we attribute to this species, though recovery of the entire shell may show characters for separation. The South Australian shell dredged by Vero and figured by Pilsbry differs from the Tasmanian form in the shape of the posterior valve and other minor differences, and may be called *Notoplax speciosa addenda nov.*

NOTOPLAX RUBROSTRATA.

Acanthochites rubrostratus Torr, Trans. Roy. Soc. S.A., xxxvi., 1913, 169, pl. vii., figs. 7a-f. St. Francis Island and Henley Beach, S.A. Type in coll. Torr.

In the original description this species was contrasted only with *speciosa*, and Ashby regards it as the South Australian representative of that species. The anterior valve is distinctly five ribbed, while the latero-pleural areas are separated by a well-marked rib, but there is no ribbing on the post-mueroal area. Torr described the girdle as "leathery covered with minute spinelets, having long silky tufts at the sutures," while Ashby states the spicules are coarse. As the type dimensions are only 11 x 6 mm. we cannot exactly determine this form.

NOTOPLAX GLAUERTI.

Acanthochiton spongialis glauerti Ashby, Journ. Roy. Soc. West Austr., x., 1923, 14, pl. i., f. 2. Cottesloe, Perth, W.A.

This is the Westralian representative of *N. speciosa*,—Ashby's *spongialis* being an exact synonym of the typical *speciosa*,—apparently differing in the ribbing of the end valves, *glauerti* being recorded as having five ribs on the anterior valve, and six ribs behind the muero on the posterior valve. Ashby's figures are curious, but not illuminating.

Dimensions: 17 x 8 mm. (Type).

Station: In sponge.

Habitat: West Australia.

NOTOPLAX SUBSPECIOSA, n.sp.

(Plate xii, fig. 2; pl. xi, fig. 14.)

This species differs from typical *N. speciosa* in the character of the girdle spicules which are large and thick. The pustulation is more elongate and there rarely appears any ribbing on the lateral areas nor on the post-mucronal slope of the posterior valve.

Dimensions: 32 x 12 mm. 26 x 11 mm. (Type).

Station: Under stones below low water mark.

Habitat: Port Arthur, South Tasmania (Type). Port Lincoln, S.A.

Remarks: Ashby separated a Tasmanian species as *A. spongialis* comparing it with *A. speciosa*. Probably the species here named was regarded by Ashby as *speciosa*, but unfortunately the series used by Ashby for his types of *spongialis* were the identical ones Iredale had compared with the type of *speciosa* in the British Museum, May having sent them to him for that purpose. Type in Australian Museum.

NOTOPLAX MACANDREWII, n.sp.

(Plate xi, figs. 4, 7, 10, 13; Plate xii, fig. 1.)

The beautiful broad girdle with silky spicules, resembling a piece of plush, makes this species one of the most striking of the order. The shell is very small in proportion to the girdle and the whole facies suggests its alliance with the *speciosa* series, though at first sight it recalls *costata*. The pustules are comparatively larger than those of *speciosa*, obsolete radials on the anterior valve, a suggestion of a lateropleural rib, but no ribs on the posterior valve. The mucro is posterior, but the post-mucronal slope is slightly slanting. The colouration of the shell is rose-red to yellowish red, the girdle silvery.

Interior pink.

Dimensions: 17 x 10 mm. Type.

Station: Under stones below low water mark.

Habitat: Shellharbour, New South Wales.

Remarks: We have great pleasure in naming this species after Mr. G. McAndrew, of Shellharbour, whose intensive collecting in the type locality has added so much to our material. Type in Australian Museum.

Series of *N. costata*.

Shell small, valves narrow, elongate, girdle very broad, finely spiculose with sutural tufts prominent.

Colouration of various tones from brick to orange.

Anterior valve generally five ribbed, otherwise much as in *speciosa*.

Median valves with linear dorsal area and lateral areas well distinguished by a nodulose rib: sculpture throughout of elevated nodules of varying shapes and sizes.

Posterior valve with mucro posterior, generally elevated, post-mucronal area small and generally ribbed.

Girdle varying from almost leathery to somewhat closely spiculose.

Interior generally pinkish white.

Insertion plates of anterior and median valves large, but that of posterior valve comparatively smaller with a strong suggestion of forward throwing.

NOTOPLAX COSTATA.

(Plate xi., figs. 1, 5, 8, 11, 14.)

Acanthochites costatus H. Adams & Angas, P.Z.S., 1864, 194. Sydney, N.S.W.

Type in Brit. Mus. Pilsbry, Man. Conch., xv., 1893, 40, pl. 3, fig. 74.

Acanthochiton costata May, Illustr. Index Tasm. Shells, 1923, pl. xv., f. 14.

In this, the first described form, the anterior valve is notably five ribbed, the general pustulose character of the shell being small flat topped ovals. The dorsal area is smooth, the lateropleural rib is well marked, while the posterior valve has the mucro at posterior third, the post-mucronal area five ribbed.

Girdle minutely spiculose, sutural tufts of large spicules prominent.

Interior pinkish white. Slits 5—1—6, posterior plate nearly vertical.

Dimensions: 18 x 7 mm. (Type).

Habitat: New South Wales, Victoria, Tasmania, South Australia.

Remarks: This species is replaced in southern Queensland by a distinct species, *gabrieli*, but ranges into South Tasmania and even to South Australia.

Specimens from Port Arthur, S. Tasmania, are larger with small crowded rounded pustules, a little larger than those of typical shells, and may be called *Notoplax costata tasmanica* nov. Type: 24 x 10 mm.

A specimen from Port Lincoln, South Australia, collected by Dr. W. G. Torr, differs in less pronounced pustules on the pleural areas, but stronger more nodulose ribs, the posterior valve with the mucro more depressed, the post-mucronal area indistinctly noded, the anterior ribbing distinct, the nodules separate, the dorsal area smooth.

NOTOPLAX SUBVIRIDIS.

Acanthochites subviridis Torr, Trans. Roy. Soc. S.A., xxv., 1911, 104, pl. xxv., figs. 3a-f. Rabbit Island, Albany, South-west Austr. Type in coll. Torr.

This is undoubtedly the Westralian representative of the *costata* series: the anterior valve is strongly five ribbed, the elongate nodules coalescing, the pustules between the ribs being almost circular: the lateral areas have strong ribs, and the post-mucronal area is strongly ribbed: the mucro posterior, the slope perpendicular, the pustules oval, flattened, concave topped, touching but not overlapping: all insertion plates very long: the dorsal area has the posterior portion pitted, the anterior smooth: the girdle leathery, the sutural tufts long and silky.

Dimensions: 22 x 12 mm. (Type).

Station: Under stones below low water mark.

Habitat: South-western Australia.

NOTOPLAX GABRIELI.

(Plate xi., figs. 3, 6, 9, 12, 15.)

Acanthochiton (Notoplax) gabrieli Ashby, Trans. Roy. Soc. S.A., xlv., 1922, 10, pl. iii., fig. 3 (pessime). Caloundra, Queensland. Type in coll. Gatliff.

This species differs at sight in the pitting of the dorsal area; the pustules are rounder, convex: the lateropleural diagonal rib consists of connected rounded pustules, the lateral area raised: the mucro is terminal, little elevated, the post-mucronal slope with a slight forward tilt, showing no ribbing.

Girdle leathery, wide, with notable sutural tufts.

Internal features diagnostic: anterior insertion plates smaller: median plates less expanded, posterior plate slightly protractive, striate.

Dimensions: That of type not given. 26 x 13 mm. (dried). Specimen figured from same lot as type.

Station: Under stones between tide marks.

Habitat: Southern Queensland.

NOTOPLAX EXTRA, n.sp.

(Plate xi., fig. 2.)

In this species the very strong oval pustulation of the pleural areas is diagnostic: the ribbing on the anterior and posterior valves, as well as the latero-pleural rib are strongly nodulose, the oval nodules showing a strong tendency to coalesce into a solid line: the median valves are more narrowed anteriorly and more attenuate than those of the preceding forms, while the girdle covering consists of short fine spicules like felt, the sutural tufts prominent. Sometimes the dorsal area, which is smooth, is coloured differently, e.g., plum, the general colouration being rose. Dimensions: 22 x 7 mm.

Station: Below low water mark.

Habitat: Southern Tasmania (Port Arthur). Type in Australian Museum.

NOTOPLAX MAYI.

(Plate xii., fig. 4.)

Acanthochiton mayi Ashby, Trans. Roy. Soc. S.A., xlv., 1922, 12, pl. iii., figs.

1a-b. Dredged 100 fathoms off Cape Pillar, Tasmania. Type in Hobart Mus.

This species was named by Ashby from valves dredged, but as only median valves are known, the correct location of the species is indefinite.

The valve here figured was dredged in 80 fathoms, 22 miles east of Narra-been, and agrees very closely with a co-type of Ashby's species in the Australian Museum, but is larger, the valve being 7 x 7 mm. As the shape suggests affinity with *speciosa*, if it followed the same proportions, the whole shell might reach a length of 60 mm. with a breadth of 20-30 mm., a fine species. It is easily distinguished from any other species by the coarse pustules, the striate beaks of the otherwise smooth dorsal area and the form of the tegmentum.

Genus GLYPTELASMA, n.gen.

An extraordinary development paralleling that of the Ischnochitonid group, *Stenochiton*, is that of the series here named *Glyptelasma*, *Acanthochites matthewsi* Pilsbry being the type. The whole shell is elongate, the girdle wide and leathery, faintly spiculose, sutural tufts small, the surface of the shell shows a linear sculpture, only granulose near beaks of median valves in some cases: the internal features resemble those of *Notoplax*. This peculiar Adelaidean development may be regarded as an offshoot of the pre-*Notoplax* stem, the internal features having altered little, though the sculpture has developed so that it is now the most specialised in the whole group of the CRYPTOCONCHIDAE and CRYPTOPLACIDAE.

The two known species are easily separated as the lateral areas of the second species, *glypta*, are smooth and unsculptured, while the sculpture on the pleural areas is reduced to a few cuts.

GLYPTELASMA MATTHEWSI.

(a). GLYPTELASMA MATTHEWSI MATTHEWSI.

(Plate xi., figs. 17, 19, 21, 22.)

Acanthochites matthewsi Pilsbry, Nautilus, vii., 1894, 120 (ex Bednall & Pilsbry MS.). South Australia = Yorke's Peninsula fide E. H. Matthews, Nautilus,

ix., 189, 72. Type lost.

Acanthochites (*Notoplax*?) *matthewsi* Pilsbry, Proc. Acad. Nat. Sci. Philad., 1894, 83, pl. iv., figs. 27-30.

Notoplax porcina Ashby, Trans. Roy. Soc. S.A., xliii., 1919, 395, pl. xli., figs. 7-10. Gulf St. Vincent, S.A. (dredged). Type in coll. Torr.

Shell medium, elongate, a little elevated, valves keeled, anterior valve faintly five waved, posterior valve large, girdle leathery, sutural tufts small.

Colour greenish white, waved irregularly longitudinally with zig zag lines of darker green.

Anterior valve apically minutely pustulose, pustules massing into irregular wavy zig zagging lines.

Median valve with long narrow triangular dorsal area almost smooth, but showing faint grooving anteriorly: lateropleural areas sculptured with longitudinal lines parallel to jugum becoming broken into pustules towards beak and on lateral area which is indicated by a slight elevation: some valves show pustules on entire lateral area, while in others these have become obsolete and one of the latter cases was described by Ashby under the name *porcina* (type examined).

Posterior valve with mucro elevated at posterior third, post-mucronal area concave below mucro and thence flattened, covered with small rounded pustules, remainder of valve as median sculpture.

Girdle large, leathery, with fine spicules present and sutural tufts of small silky spines.

Interior bluish-white. Slits 5—1—6.

Dimensions of lost type: 26 x 8 mm. (dried). Neotype, 14 x 5 mm. (dried). *porcina*: 35 x 11 mm.

Station: Below low water and dredged.

Habitat: South Australia, Victoria.

Remarks: The type was unfortunately lost in transit after Pilsbry's figures were drawn: the neotype figured is from the type locality.

(b). GLYPTELASMA MATTHEWSI OCCIDENTALIS, n.subsp.

(Plate xi., figs. 18, 20.)

The West Australian shells, collected by Hull at Middleton Beach, King George Sound, differ subspecifically in the more crowded linear sculpture of the median valves and their notably more slanting direction: the pustulose area is restricted to the central portion of the pleural areas, but the interstices of the ribs being scratched more extensive nodulation is apparently seen. The jugal area is broader and the lines number twenty, whereas in the typical form they only number thirteen in the same sized shell. The anterior valve has distinct V wrinkling between the linear radials, whereas the typical form shows uninterrupted wavy wrinkling.

Dimensions: 21 x 9 mm.

Station: Under stones below low water mark.

Habitat: South-west Australia. Type in Western Australian Museum.

GLYPTELASMA GLYPTA.

(Plate xi., fig. 23.)

Acanthochites (*Notoplax*) *glyptus* Sykes, Proc. Mal. Soc., ii., 1896, 92, pl. vi., figs. 5, 5a. Port Phillip, Victoria. Type in Nat. Mus., Melbourne.

This species is readily recognised by its complete lack of nodular sculpture, the whole shell being smooth save for a few slanting cuts on the pleural areas: the lateral areas are slightly raised but no dividing rib. The anterior valve is similarly five waved, the elevations scarcely distinguishable: dorsal area not differentiated: the mucro elevated at about posterior fourth, the post-mucronal area a little excavate.

Girdle leathery, tufts small and inconspicuous.

Interior white. Slitting 5—1—6.

Dimensions: 22 x 7 mm. (Type).

Station: Dredged.

Habitat: Victoria.

Remarks: The specimen figured was kindly loaned to us by Mr. C. J. Gabriel.

Genus CRASPEDOPLAX, n.gen.

This genus is introduced, with type, *Hanleya variabilis* A. Adams & Angas. This is a peculiar form showing many differences from the normal *Acanthochitonids*, the anterior insertion plate, though five-slit, being short and *Ischnochitonoid* in appearance, the median valves showing sutural laminae sometimes large but comparatively small for the family, while the insertion plate of the posterior valve is small, somewhat irregularly 6-10 slit and with age disappearing, a callus ridge not unlike that of a *Poneroplax* or *Onithochiton* developing. The radula was examined by Thiele, who classed the type species under *Loboplax*, a group very unlike in every other feature. The girdle shows the usual sutural tufts, but scale-like spicules otherwise cover it. It appears to be more closely related to *Craspedochiton*, but differs from that group in habitat, girdle features and apparently also in the radula. The species may be recognised superficially.

Shell broad to medium, low *variabilis*.

Narrow, elevated, pleural areas coarsely sculptured *cornuta*.

Narrow, elevated, pleural areas finely sculptured *elegans*.

CRASPEDOPLAX VARIABILIS.

(Plate xi., figs. 29-34.)

Hanleya variabilis H. Adams & Angas, P.Z.S., 1864, 194. Yorke Peninsula, South Australia. Type lost.

Acanthochites (Loboplax) variabilis Bednall, Proc. Mal. Soc. ii., 1897, 156.

Acanthochites rufus Torr, Trans. Roy. Soc. S.A., xxxvi., 1912, 167, pl. vi., figs. 4a-f. Kangaroo Island, South Australia.

Loboplax variabilis Thiele, Revision Chitonen, 1910, 72, pl. vii., figs. 9, 10, 11.

Shell small, depressed, broadly ovate to elongate oval, girdle scaly with small sutural tufts of spicules.

Colour green, varied with yellow or white: black: black and white: red, etc.

Anterior valve broad and shallow, pustulose throughout, five indistinct waves being generally discernible: pustules small and round.

Median valve with triangular dorsal area showing longitudinal lines of small elongate pustules: the lateropleural area showing different series of pustules: those on the lateral area, which is very small and slightly raised, small and massed, those on the pleural areas larger slanting ovals arranged in irregular longitudinal series: this arrangement is very pronounced in some juveniles and is altogether obsolete in most adults which then show practically a uniform pustulose surface.

Posterior valve with the muero post central, the post-muconal area flattened, the ante-muconal wedge indistinct, otherwise pustulose.

Girdle finely scaly with small sutural tufts of glassy spicules.

Interior greenish to white. Slitting 5—1—10 to 0.

Dimensions: 16 x 10 mm. (Type). 10 x 5 mm. (*rufus*). 13 x 7½ mm. Specimen figured.

Station: Between tide marks, generally associated with calcareous algae.

Habitat: Queensland, New South Wales, Victoria, Tasmania, South Australia. South-west Australia.

Remarks: This species from the type locality, the specimen figured may be regarded as the neotype, is a large broad shell, the name *variabilis* being very pertinent; the New South Wales shells are much smaller, comparatively longer and narrower, more elevated, while the pustulation is more regular and may be called *Craspedoplax variabilis cambrica*, n.subsp., the North Queensland shells are still smaller with notably coarse pustules and may be distinguished as *Craspedoplax variabilis diminuta*, n.subsp.

CRASPEDOPLAX CORNUTA.

(Plate xi., fig. 39.)

Acanthochites cornutus Torr & Ashby, Trans. Roy. Soc. S.A., xxii., 1898, 217, pl. 6, fig. 3. Marino, S.A. Type in coll. Torr.

Acanthochites exilis Torr & Ashby, Trans. Roy. Soc. S.A., xxii., 1898, 218, pl. 7, fig. 6. Gulf St. Vincent, S.A. Type in coll. Torr.

Acanthochites cornutus Ashby, Trans. Roy. Soc. S.A., xlv., 1922, 17.

Shell small, elevated, semikeeled, dorsal area trigonal, girdle minutely scaly with prominent sutural tufts.

Colouration yellowish green marbled with greenish white.

Anterior valve semicircular, covered with small rounded pustules and obsoletely waved with five undulations.

Median valves with dorsal trigonal area longitudinally striate and separated from the lateropleural areas by a series of longitudinal pits, generally five in number: the lateral area is differentiated by a slight wave, small in extent, and minutely pustulose: the pleural areas are covered with much larger pustules arranged longitudinally, from ten to twelve rows being counted on each side.

Posterior valve with elevated posterior muero, the post-muconal area a little concave below the muero, sculpture similar to that of other valves.

Girdle scaly, sutural tufts with few long spicules present.

Interior white. Slitting 5—1—6, side slit very low.

Dimensions: 8 x 3 mm. Type: 3 x 1 mm. (type of *exilis*): 8 x 3.5. Specimen figured.

Station: Dredged.

Habitat: South Australia, Victoria.

Remarks: Ashby has affirmed that the two species Torr & Ashby described at the same time are synonymous, and has named a specimen dredged at Sorrento, Victoria, by Mr. C. J. Gabriel as conspecific. From the lastnamed specimen, kindly loaned to us by Mr. Gabriel, our description and figure have been prepared.

CRASPEDOPLAX ELEGANS, n.sp.

(Plate xi., figs. 35-38.)

Shell small, elongate, elevated, carinate, girdle scaly, tufts prominent.

Colouration pinky grey with scarlet blotches at times, otherwise mottled.

Anterior valve obsoletely rayed with larger pustules, the pustulation being minute elongate ovals, flattened but convex topped.

Median valves with dorsal area narrowly cuneate flanged with ditches and minutely pitted; the lateral areas small, slightly raised but not differentiated in the character of the pustules which are somewhat irregular small convex ovals radiating outwards on the pleural areas.

Posterior valve with an elevated posterior mucro at about the posterior third, post-mucronal slope straight.

Girdle minutely scaly with small sutural tufts of glassy spicules.

Interior greenish white with dark green median blotches. Slitting 5—1—6. Plates small, delicately striate, median slit very low down.

Dimensions: 8.5 x 4 mm.

Station: Under stones between tide marks.

Habitat: Howick Island, Queensland. (Type). North Head, Bowen, North Queensland. Type in Queensland Museum.

Genus CRASPEDOCHITON.

Craspedochiton Shuttleworth, Mittheil. Naturf. Gesell. Berne, 1853, 67. Type by monotypy *Chiton laqueatus* Sowerby.

Angasia Dall, Proc. U.S. Nat. Mus., 1881, pp. 283, 286, 289, 290 (1882). ? *Nom. nud.* Type by original designation *A. tetrica* Cpr., Ceylon (not described).

Angasia Pilsbry, Man. Conch., xiv., 1893, 286. Type by monotypy *A. tetrica* Cpr. MS., Ceylon, pl. 61, figs. 27-32.

Not *Angasia* White, P.Z.S., 1863, 498.

Spongiochiton Dall, Pro. U.S. Nat. Mus., 1881, pp. 283, 286 (1882). ? Indeterminate. Type by monotypy, *S. productus* Cpr. (not described).

Spongiochiton Pilsbry, Man. Conch., xiv., 1892, 26, xv., 1893, 35, pl. 1, figs. 14-22. (*A. carpenteri*) fide Iredale, Proc. Mal. Soc., ix., 1910, 100.

Phacellozona Pilsbry, Nautilus, vii., 1893, 139: new name for *Angasia* supra.

Thaumastochiton Thiele, Revision Chitonon, 1909, 34. Type by monotypy

Craspedochiton (*Thaumastochiton*) *mobiusi* Thiele.

An Indo-Pacific group of many names, but few specimens, most of which have been dredged. The notable feature is the anterior production of the girdle and the degeneration of the posterior insertion plate. Thus through the anterior production of the girdle the anterior insertion plate is very long, almost as long as that of *Notoplax*, whereas that of the posterior valve is small and many slit, being reduced to a callus in the subgenus *Thaumastochiton*.

The animal is small, resembling in this respect, that of *Loricella*. The specific characters given below apply generally as the species are not well differentiated. The type species was described from the Philippines, and *Angasia tetrica* from Ceylon, but a variety *calculosa* of the latter was distinguished from the Philippines, the latter being the typical species. Reeve had described *Chiton petasus* (P.Z.S., 1847, 25, Conch. Icon., iv., 1847, pl. xxvi., fig. 112) from N. W. Celebes, and this form was later redescribed by Nierstrasz as *Craspedochiton tessellatus* (Siboga Exped. Monog., xlviii., 1905).

Though Ashby separated the Australian form from that of the Philippines, he did not compare it with Reeve's and Nierstrasz's species with which it may be identical.

CRASPEDOCHITON JAUBERTENSIS.

Craspedochiton jaubertensis Ashby, Trans. Roy. Soc. S.A., xlviii., 1924, 326, pl. xxxi., figs. 5a, b, c. Off Cape Jaubert, North-west Austr., 70 feet. Type

in coll. Ashby.

Craspedochiton laqueatus Sowerby, Odhner. Kungl. Svenska. Vetensk. Handl., Bd., 52, 1917, 70. Same specimens.

Shell small, tegmentum normal, girdle wide, produced anteriorly and narrowed posteriorly, shell slightly elevate, semicarinate.

Colour rosepink throughout, blotched sometimes with white.

Anterior valve five ribbed, ribs composed of larger pustules running into each other, the whole of the valve covered with pustules of various sizes and shapes, mostly circular but some oval, all convex topped.

Median valves with dorsal area smooth, that of the first median valve triangular bounded by a rib, the pleural areas being separated by a rib from the lateral areas which are notably elevated: the succeeding median valves do not show the dorsal boundary rib: the pustules on the pleural areas are small convex ovals arranged in about ten longitudinal rows on each side, the lateral areas showing two elevated rows of larger pustules with a few smaller ones between.

Posterior valve with the mucro flattened, a little before the middle, the post-mucronal slope depressed, tuberculose, smaller towards the dorsal area.

Girdle leathery with a few glassy spicules showing at sutural pores.

Interior white, deep rose medially. Slits 5—1—9, festooned.

Dimensions: 36 x 22 mm. (Ashby). Odhner, 27.5 x 18 mm. Specimen figured, 20 x 12 mm.

Station: Shallow water, generally dredged.

Habitat: Tropical Northern Australia from Cape Jaubert, North-west Australia to Cape York, Queensland. Abrolhos, W.A.

Remarks: The whole specimen figured is from Torres Straits, and agrees with shells received from Odhner, part of the lot whence Ashby described his species. One of the latter provided the dissected drawings.

Genus *CHORIPLAX*.

Chorioplax Pilsbry, Nautilus, vii., 1894, 139: new name for *Microplax* H. Adams & Angas.

Microplax H. Adams & Angas, P.Z.S., 1864, 194. Type by monotypy *M. grayi* H. Adams & Angas.

Not *Microplax* Fieber, Europ. Hemipt., 1861, 53.

This peculiar group is only known by two specimens, one from Port Jackson, the other from South Australia. The similarity of the species to those of *Leptoplax* may be only superficial, while its relationship to *Cryptoconchus* is very distant, and it belongs to a different suborder to *Katharina* and *Amicula*. While we regard *Chorioplax* as a member of the *Cryptoconchidae*, *Katharina* belongs to the family *Mopaliidae* as Thiele's studies effectually decided.

Shell elongate, thin, delicate, girdle horny. Tegmentum reduced to a very small more or less circular patch: articulamentum large, sutural laminae very small, unslit.

CHORIPLAX GRAYI.

(a). *CHORIPLAX GRAYI GRAYI*.

(Plate xi., figs. 24-27.)

Microplax grayi H. Adams & Angas, P.Z.S., 1864, 194. Sydney Harbour. Type in British Museum.

Microplax grayi Angas, P.Z.S., 1865, 58, pl. 11, fig. 16. P.Z.S., 1867, 224.

Microplax grayi Pilsbry, Man. Conch., xiv., 1892, 21, pl. 6, figs. 9-11.

Shell elongated, convex, brown: exposed portion of the valves minute, wide heart shaped, carinated, strongly granulated, the intervals between the exposed

parts of the valves about as long as the latter. Lateral areas defined by a distinct rib. Girdle moderate, corneous, smooth. Length, 13; width, 5 mm.

There is little to add to the original description as this typical form has not been met with since: it is quite transparent, looking like thin horn, very elevated: the exposed parts of the valves measure 1.5 to 1.75 mm. We have reproduced the figures drawn by E. A. Smith from the type and the species will be readily recognised when re-discovered.

(b). *CHORIPLAX GRAYI* PATTISONI.

(Plate xi., fig. 28.)

Chorioplax grayi pattisoni Ashby, Trans. Roy. Soc., S.A., xlv., 1921, 137, pl. ix., figs. 1a-c. Near Cape Banks Lighthouse, S.A. Type in coll. Pattison.

A specimen from S.A. generally agreeing with the preceding was separated subspecifically and this may be granted until more material is secured. Length,

Family CRYPTOPLACIDAE.

18 x 8.5 mm.: exposed portion of valves with a maximum of 1.5 mm. in breadth by 1 mm. in length. Ashby regarded as the sutural laminae the articulamentum of Carpenter, and later reported that the type of *grayi* was very much longer and narrower in proportion, but the measurements deny this, and the specimens have not been compared together.

This family comprises a series which appear specialised relatives of the preceding, but as the species are now well distinguished and are known from the Tertiary Beds of Australia in the same advanced state, we allow the family distinction.

The members are all elongate, worm-like Loricates with a narrow shell embedded in a huge fleshy girdle which is densely spiculose. The juveniles of all species have the valves in contact but as they grow the valves become separated, and in some cases do not increase in size, so that the valves are comparatively larger in the former state. There is a strong tendency to absolute diminution of the valves so that almost a valveless form may yet be found. The nearest approach is one that insinuates itself into coral blocks and the valves are very minute and widely separated: this form probably occurs in Australian waters, but has not yet been recovered. The girdle shows small sutural tufts, but these are not always superficially visible, but are more prominent in life.

The internal features are characteristic: the anterior insertion plate is large, generally three slit, the slits with an inclination to become lost, the median valves with large sutural laminae, but with no slits, the posterior valve with an unslit insertion plate, sometimes thrown backward, but generally with a strong forward direction.

The external sculpture is granulose, sometimes the granules forming chains of lozenges, at others massing into irregular lines, the dorsal area linear, narrow, smooth, the lateropleural areas united and indistinguishable; the mucro of the posterior valve practically terminal, often absolutely so. In shape the first valve is circular, generally more than a semicircle, the second valve is irregularly orbicular, the third roundly oval, the remainder elongate ovals.

Genus CRYPTOPLAX.

Cryptoplax Blainville, Dict. Sci. Nat. (Levrault), xii., 1818, 124. Type by subsequent designation, Haddon Chall. Rep., xv., 1886, 37 *Chiton larvaeformis* Burrow.

Chitonellus Lamarck, Hist. Nat. Anim. s. Verteb., vi., pt. 1, 1819, 316. Type by

tautonymy *C. laevis* = *Chiton chitonellus* Blainville, 1825 = *Chiton larvaeformis* Burrow.

Oscabrella Broderip, British Cyclopaedia, ii., 1836, 31 (as of Lamarek). Type by monotypy *Chitonellus laevis* Lamarek.

Chitoniscus Hermannsen, Index Generum Malaeoz., 1846, 225. New name for *Chitonellus* Lamarek.

Ametrogephyrus, *Phaenochiton* and *Dichachiton* Middendorff, Mem. Sci. Nat. Acad. Imp. Sci. St. Petersburg, vi., 1847, 97, Feb., 1848. Type by present designation *Chiton larvaeformis* Burrow.

As there is only one genus in the Family the characters given need not be restated: for many years attempts were made to distinguish two genera by means of the presence or absence of sutural pores and tufts, but it is now known that no importance is attachable to the presence or apparent absence of these pores. The girdle spicules vary in size, according to age, while little essential variation in the different species can be determined: the sculpture varies appreciably, and in the most restricted species, such as *mystica*, two series may be separated, one with longer, narrower valves, the other with shorter, broader, valves, the shells showing similar differences in sculpture so that sexual variation is suggested. In the juveniles the posterior insertion plate is a little backward or perpendicular, even when the adult shows strong forward movement, and the slitting in the anterior valve is generally more pronounced and suggestive of five slits.

Measurements of animals, dried or in spirits, are practically useless as though Pilsbry noted that those of "mummies" were seemingly useless, these animals can contract or expand in life and die in any state so that spirit specimens show all the faults seen in dried ones.

A guide to the species is here presented:

Valves scarcely disconnected:

Sculpture of lozenge shaped nodules *mystica*.

Sculpture nodules coarser: shell smaller *torresiana*.

Valves (posterior) disconnected:

Sixth valve large.

Spicules coarse *striata*.

Spicules very fine *iredalei*.

Sixth valve small.

Posterior insertion plate thrown forward *larvaeformis*.

Posterior insertion plate straight *royana*.

All valves small.

Spicules short and stout *burrowi*.

Spicules longer and finer *hartmeyer*.

CRYPTOPLAX LARVAEFORMIS.

(Plate xii., figs. 5, 10, 17, 25, 28, 35.)

Chiton larvaeformis Burrow, Elements Conchology, 1815, 191, pl. xxviii., figs.

2-4. No loc. Type in British Museum.

Cryptoconchus larvaeformis id. ib., 190, ex Blainville, MS., n.n.

Cryptoplax larvaeformis Blainville, Dict. Sci. Nat. (Levrault), xii., 1818, 124.

Chitonellus laevis Lamarek, Hist. Anim. s. Verteb., vi., pt. 1, 1819, 317. New

Holland (Peron & Lesueur). Type in Paris Mus.

Chiton chitonellus Sowerby, Genera Recent and Fossil Shells, pt. xii., 1823, pl. 139, new name for *Chitonellus laevis* Lamarek.

Chiton eruciformis Sowerby, id. ib., text to pl. 139, new name for *Chitonellus laevis*, Lamarek.

- Chiton chitonellus* Blainville, Dict. Sci. Nat. (Levrault), xxxvi., 1825, 550, new name for *C. laevis* Lamarck.
- Chiton laevis* Blainville, Manuel Malac., 1825, 603, pl. 87, fig. 5 (Lamarck's type figured).
- Chiton larvaeformis* Blainville, id. ib., fig. 6 (Prob. Peron spec.).
- Chiton vermiformis* Blainville, Dict. Sci. Nat. (Levrault), xxxvi., 1825, 553, new name for *C. larvaeformis* Burrow.
- Chiton fasciatus* Quoy & Gaimard, Voy. de l'Astrol Zool., iii., 1835, 408, pl. 73, figs. 21-29. Tonga Tabu. Type in Paris Mus.
- Chiton oculatus* Quoy & Gaimard, id. ib., 410, pl. 73, figs. 37-38. New Guinea or Vanikoro. Type in Paris Mus.
- Chitonellus fasciatus* Reeve, Conch. Syst., ii., 1842, 13, pl. cxxxv., figs. 3, 4, 5. Philippines.
- Cryptoplax fasciata* Brazier, Proc. Linn. Soc. N.S.W., ii., 1877, 75. Darnley I., Torres St.
- Cryptoplax oculata* ? Brazier, id. ib., 75. Sue I., Torres St.
- Cryptoplax montanoi* Rochebrune, Bull. Soc. Philom. Paris, Ser. 7, vi., 1882, 190. Borneo and Lucon. Type in Paris Mus.
- Cryptoplax montanoi* Thiele, Revision Chitonen, 1909, 52 (= *oculata* Q. & G.).
- Cryptoplax peroni* Rochebrune, Bull. Soc. Philom., Paris, Ser. 7, vi., 1882, 191. New Holland (Peron & Lesueur), based on type of *C. laevis* Lam. in Paris Mus.
- Cryptoplax peroni* Thiele, Revision Chitonen, 1909, 56 (redescribed).
- ? *Cryptoplax caledonicus* Rochebrune, Bull. Sci. Philom., Paris, Ser. 7, vi., 1882, 196. New Caledonia (not common). Type in Paris Mus.
- Cryptoplax caledonicus* Thiele, Revision Chitonen, 1909, 55, pl. vi., figs. 97-102.
- Cryptoplax huerteli* Rochebrune, Bull. Sci. Philom. Paris, Ser. 7, vi., 1882, 196. New Caledonia (rare). Type in Paris Mus.
- Cryptoplax huerteli* Thiele, Revision Chitonen, 56, pl. vi., figs. 103-107.
- ? *Cryptoplax unciniferus* Rochebrune, Bull. Soc. Philom. Paris, Ser. 7, vi., 1882, 196. New Caledonia (common). Type in Paris Mus.
- ? *Cryptoplax unciniferus* Thiele, Revision Chitonen, 1909, 55 (= *caledonicus* Rochebrune).
- Cryptoplax larvaeformis* Haddon, Zool. Rep. Challenger, xv., 1886, Polypl. 37, pl. iii., fig. 12 a-m. Fiji.
- Cryptoplax larvaeformis* Pilsbry, Man. Conch., xv., 1893, 56, pl. 11, figs. 31-36, 40-43. Viti I. specs. Tonga Tabu, Fiji and Philippines.
- Cryptoplax larvaeformis* Pilsbry, Proc. Mal. Soc., iv., 1901, 154, pl. xiv., figs. 12-16. Viti and Samoa I.
- Cryptoplax larvaeformis* Nierstrasz, Siboga Exped. Monog., xlviii., 1905, 73, pl. figs. 154-158. Molucca Islands.
- Cryptoplax larvaeformis* Thiele, Revision Chitonen, 1909, 54, pl. vi., figs. 87-89. Hapai, Tonga group.
- Cryptoplax oculatus* Haddon, Zool. Rep. Challenger, xv., 1886, Polypl., 41, pl. 1, fig. 10, pl. iii., figs. 10 a-m. Samboangan, Philippine I.
- Cryptoplax oculatus* Melvill & Standen, Journ. Linn. Soc. (Lond.) Zool., xxvii., 1891, 181. Torres Straits.
- Cryptoplax oculatus* Pilsbry, Man. Conch., xv., 1893, 55, pl. 9, figs. 1-5 (Haddon's account only).
- Cryptoplax oculatus* Nierstrasz, Siboga Exped. Monog., xlviii., 1905, 74, pl. , fig. 28, fig. 151-153.

Cryptoplax coronatus Thiele, Revision Chitonon, 1909, 54, ex Rochebrune M.S., specimens of *larvaeformis* from Tonga Tabu: probably types of *fasciatus* Quoy & Gaimard, in Paris Mus.

Cryptoplax lamarchi Thiele, Revision Chitonon, 1909, 54, ex Rochebrune M.S., specimens of *larvaeformis* from New Caledonia in Paris Mus.

Cryptoplax lamarkii Dupuis, Bull. Mus. Hist. Nat. Paris, Jr., 1918, 529 (states specimens are part of *laevis* Lam., probably incorrectly, more likely figured shells of *larvaeformis* Blainville with false locality added).

This large species is superficially recognisable by the separation and size of the four last valves, and the posterior insertion plate is thrown very much forward.

Contrasted with *striata* in which the sixth valve is very large, in this form it is very small: the first four valves are generally in contact, the fifth is a little separated and less than the fourth, the sixth further apart and still less, the seventh still further away but slightly larger, while the posterior approaches closely to the seventh and is a little larger. Such is the position of the valves in an adult specimen, but a senile shell may show the valves a little more separated: in the juvenile all the valves are closely in contact, the last valve appearing very large.

The sculpture varies peculiarly: in the immature it may show almost linear sculpture in the posterior valves while retaining nodulose sculpture in the earlier ones: in some half-grown shells the whole of the valves may show nodulose sculpture, while in senile shells this may be worn away and a sculpture of deep concentric growth lines alone be seen. Some specimens show the apices of the valves well raised and peaked, while others show the apex depressed and worn. The girdle spicules are elongate, blunt, and superficially smooth, but microscopically faintly striate.

Dimensions: 107 x 20 mm., 82 x 14 mm. (dried).

Station: Under coral blocks.

Habitat: North Queensland. Extralimital.

Remarks: The complicated history of this species is shown by the synonymy. When Blainville studied the specimens of this Order at the British Museum he labelled two species with the new generic name *Cryptoconchus*, one of these being called *C. larvaeformis*. His essay was at the time denied publication and Burrow, writing a little book on Conchology with access to the British Museum described the species as new, did not use Blainville's generic name, but accepted his specific name. Some years afterwards Blainville was commissioned to prepare the conchological articles for a French Dictionary of Natural Science, and there introduced the new genus but altered the spelling to *Cryptoplax*. The next year Lamarck named the same genus *Chitonellus* introducing two species *laevis* and to *vermiformis*, suppressing the genus *Cryptoplax* or *Chitonellus*. Ten years *striatus*, both in the Paris Museum. Blainville later altered the name *larvaeformis* later Quoy & Gaimard described and figured two more species as *Chiton*, *C. fasciatus* from Tonga Tabu and *C. oculatus* from New Guinea or Vanikoro. These two have been recently regarded as different species, the former being recognised as a synonym of *larvaeformis*, but they are now shown to be identical. Rochebrune, having access to the material at the Paris Museum, made a number of new species, basing them upon the types of Lamarck, Blainville, Quoy & Gaimard and other specimens. He transferred or destroyed original labels and consequently made all reviews unsatisfactory. His descriptions are inadequate and incorrect, and it is difficult to make certain of any data in connection therewith.

However, from criticism of the known species and localities and the remarks made by those who have examined this material, we conclude that our synonymy shows the facts.

As to the exact synonymy of *oculata* and *larvaeformis* we have shells collected by Dr. Paradise at Maori Reef on the Great Barrier Reef, showing the two "species" exactly, but they are certainly conspecific: these are confirmed by a series collected at Murray I., Torres Straits, at one end of the Reef and another series from Masthead Reef at the other end, both collected by Mr. C. Hedley.

CRYPTOPLAX MYSTICA, n.sp.

(Plate xii., figs. 9, 19, 21, 22, 23, 27, 33.)

Chitonellus striatus Reeve, Conch. Icon., iv., 1847, *Chitonellus*, pl. 1, figs. 4 a-b.

Cryptoplax striatus Haddon, Zool. Rep. Challenger, xv., 1886, Polypl., 39, pl. i., fig. 9, pl. iii., fig. 9 a-m., and of Smith, Pilsbry and recent authors generally, but not *C. striatus* Lamarck.

Cryptoplax torresianus Rochebrune, Ashby, Trans. Roy. Soc. S. Austr., xlv., 1922, 577/8: not of Rochebrune.

Cryptoplax rostratus Reeve, Ashby, id., xlvii., 1923, 239, pl. xix., figs. 2a, b, c.: not of Reeve.

Shell large, elongate, comparatively broad, last four valves scarcely disconnected when adult, sculpture coarsely nodulose, girdle densely coarsely spiculate.

Colouration of girdle yellow to brown, of shell red brown, grey or yellow, often with a white dorsal stripe.

The broad valves and the lozenge shaped nodulose sculpture with the broad connected valves separate this from all species except the next one.

The posterior valve has the mucro terminal, the post-mucronal slope directed forwards.

Girdle spicules long, pointed, and coarsely striated.

Interior bluish green, darker medially. Posterior insertion plate thrown very abruptly forward and flattened.

Dimensions: 64 x 15 mm. (dried).

Station: Under stones below low water mark, and in worm holes and crevices in soft rocks.

Habitat: New South Wales.

CRYPTOPLAX TORRESIANA.

Cryptoplax torresianus Rochebrune, Bull. Soc. Philom. Paris, Ser. vii., 1882, 195. Torres Straits. Type in Paris Mus.

Cryptoplax torresianus Thiele, Revision Chitonen, 1909, 9 (= *striata* Lam.).

Cryptoplax striatus Smith, Rep. Zool. Coll. Alert, 1884, 84.

Cryptoplax striatus Melville & Standen, Journ. Linn. Soc. (Lond.) Zool., xxvii., 1891, 181. Torres Straits.

Cryptoplax striatus Shirley, Proc. Roy. Soc. Q'ld., xxiii., 1911, 96.

Thiele has stated that Rochebrune's *torresianus* named from Torres Straits is the same as the Port Jackson species (*striata olim*), and Ashby formerly suggested Rochebrune's name should be used for the N.S.W. species. As there is a shell living in North Queensland that simulates the N.S.W. shell we leave *torresiana* to that species. There is a discontinuity of range as the N.S.W. species has not yet been found in South Queensland.

We have examined shells from Cairns, North Queensland, which resemble the Port Jackson shell, but have distinctly coarser sculpture, while they are smaller. The posterior valve appeared to have the mucro not terminal, and the girdle spicules seemed coarser. This we call at present *torresiana*.

A shell from Pelsart I. Abrolhos, West Australia, also resembles the New South Wales species, but though curled and only about 20 mm. in length seems to be adult, the valves being solid: the girdle spicules are striate, while the sculpture is coarse, the nodules more separated and less lozenge shaped: the sutural laminae are more spread out in the median valves and the insertion plate of the posterior valve shorter terminally and less thrown forward.

CRYPTOPLAX STRIATA.

(Plate xii., figs. 7, 12, 15, 20, 29, 36.)

Chitonellus striatus Lamarek, Hist. Anim. s. Vertel, vi., 1819, 317. Seas of New Holland, Peron & Lesueur = Kangaroo I. Type in Paris Mus.

Chitonellus gunnii Reeve, Conch Icon, iv., 1847, *Chitonellus*, pl. i., sp. & fig. 5. Van Diemen's Land. Type in Brit. Mus.

Chitonellus rostratus id. ib., pl. i., sp. & fig. 6. Raines I., Torres St., error = Tasmania. Type in Brit. Mus.

Cryptoplax gunnii Pilsbry, Proc. Mal. Soc., iv., 1901, 156, pl. xv., figs. 17-19, 24-26.

Cryptoplax striatus Ashby, Trans. Roy. Soc. S. Austr., xlvii., 1923, 237, pl. xix., fig. 5. var. *gunnii* id. ib.

Cryptoplax striatus May, Illustr. Index Tasm. Shells, 1923, pl. xvi., fig. 6.

Not *Cryptoplax striatus* of authors dealing with specimens from New South Wales.

Shell very large and elongate, valves long and narrow, posterior four disconnected when half-grown, sculpture tending to longitudinal ribbing, girdle densely coarsely spiculate.

Colouration dull, brown and red, sometimes girdle differently coloured or even banded with lighter as in "*rostratus*."

Anterior valves longer than broad, sculpture becoming obsolete.

Median valves lengthened and narrow, the sixth valve large: the second valve broad, rest narrower.

Posterior valve shorter than seventh valve with mucro almost posterior, but post-mucronal slope a little produced backward and concave.

Interior greenish white. Posterior insertion plate large and nearly perpendicular.

Juvenile sculpture resembles that of New South Wales *mystica*.

Dimensions: 92 x 16 mm., 100 x 19 mm., 121 x 15 mm.

Station: Below stones below low water mark.

Habitat: Victoria, South Australia, Tasmania, West Australia.

Remarks: Apparently no one has recently examined Reeve's figure and description of *Chitonellus rostratus* as though he gave "Raines' Island, Torres Straits: Capt. Ince," there can be no hesitation in denying that locality, the figure being a good one of a Tasmanian shell, the surveying ships sheltering in South Tasmania during the hurricane season in Torres Straits. It is certainly not the Port Jackson species with which it has been identified by Ashby.

From all localities two forms of the species are met with and we believe these to be sexual: these are represented by the names *gunnii* and *rostrata*. At present we are unable to definitely separate the many subspecies that exist, while

there may even be two species confused.

West Australian specimens from various places collected by Hull are less elongate, valves less separated, mucro of the posterior valve nearly terminal and the sculpture more nodulose. These we call *C. striata occidentalis* subsp. n. and they are quite different from *Cryptoplax striata* var. *westernensis* Ashby, Trans. Roy. Soc. South Austr., xlvii., 1923, 238, from Rottnest, W.A., coll. Ashby, which is stated to differ in lacking the granulose sculpture with the girdle spicules shorter and more slender: dimensions, 35 x 15 mm.

CRYPTOPLAX IREDALEI.

(Plate xii., figs. 6, 11, 18, 26, 30, 34.)

Cryptoplax iredalei Ashby, Trans. Roy. Soc. S. Austr., xlvii., 1923, 238, pl. xix., fig. 4. Port Lincoln, Gulf St. Vincent, S. Austr. Type in coll. Ashby.

Cryptoplax gunnii May, Illustr. Index Tasm. Shells, 1923, pl. xvi., fig. 7.

Similar to the preceding in general appearance but easily separable by the very different girdle spicules which are very fine, the girdle appearing like felt.

Colouration distinct: valves purple, girdle purple banded with grey.

The valves are even narrower than those of the preceding species, while the sculpture is even more linear: the smooth dorsal area in the adult becomes concave, showing curved growth lines. Posterior mucro terminal.

Interior pinkish white. Posterior insertion plate produced forward.

Dimensions: 81 x 18 mm., 72 x 21 mm.

Station: Under stones below low water.

Habitat: Victoria, Tasmania, South Australia, West Australia.

Remarks: West Australian shells from Pelsart I., Abrolhos, have even longer and narrower valves, the sculpture irregularly wavy and linear, the smooth dorsal area diminishing in width in the valves posteriorly so that in the last three it appears as a narrow gutter: the girdle spicules are even more delicate than those of the eastern forms. We introduce for it the subspecific name *Cryptoplax iredalei attenuata* n. subsp. On the other hand the South Tasmanian form which has been figured by May as *C. gunnii* is a smaller shell than the typical one, the valves broader, less separated, the sculpture very similar, but the girdle spicules notably larger, pointed, apparently smooth and scattered. The posterior valve has the mucro posterior, but more depressed, and the posterior insertion plate does not slope so much forward. This may be a distinct species, but at present we prefer to name it as a subspecies *Cryptoplax iredalei meridiana* n. subsp. Type from Port Arthur, S. Tasmania. 58 x 11 mm.

CRYPTOPLAX BURROWI.

(Plate xii., figs. 13, 31, 32.)

Chiton (Chitonellus) burrowi E. A. Smith, Rep. Zool. Coll. Alert, 1884, 85: new name for *C. larvæformis* Reeve not Burrow: also from Port Molle, Queensland (Coppinger). Type in Brit. Mus.

Chitonellus larvæformis Reeve, Conch. Icon., 1847, *Chitonellus*, pl. 1, fig. 3. Port Adelaide, Australia, error = North Queensland.

Not *Cryptoplax burrowi* Haddon, Zool. Rep. Challenger, xv., 1886, Polypl., 42, pl. iii., figs. 11 a-m (which refer to a form of *C. elioti* Pilsbry).

Not *Cryptoplax burrowi* Pilsbry, Man. Conch., xv., 1893, 54, pl. 9, figs. 6-10 (copies).

Shell small for the group, posterior valves separated, sixth smallest, girdle spicules blunt and flattened.

Colouration yellowish brown, girdle yellowish.

In the dried shells the first four valves are in contact, the fifth half a valve length away, the sixth three valve lengths away, the seventh four valve lengths distant, the eighth less than two valve lengths distant.

In size the fifth valve is less than the fourth, the sixth less than the fifth, the seventh larger than the sixth and the eighth larger than the fourth. The sculpture is nodulose in the juvenile, irregularly linear in the adult where it becomes indistinct. The posterior valve has the tegmentum elevated medially, the mucro elevated and posterior.

Interior white. Slitting normal.

Dimensions: 57 x 12 mm. Type.

Station: Among coral blocks.

Habitat: North Queensland.

Remarks: When E. A. Smith named this species he regarded the figure given by Reeve for his *Chitonellus larvaeformis* as sufficiently exact to represent this species. Smith's specimens were from Port Molle, N. Queensland, collected by Coppinger, whereas Reeve had given the locality "Port Adelaide." As in the case of *Haploplax adelaidensis* Reeve discussed in this Monograph, p. 293, Reeve's locality is undoubtedly erroneous and *burrowi* came from Queensland. When Haddon reported upon the Challenger Polyplacophora he reproduced drawings made by Smith from specimens in the British Museum, but it is now seen that Smith had confused another species as the valves figured appear to belong to a form of the *elioti* group, a copy reproduced (pl. xii., fig. 32), being quite unlike that of the true *burrowi* (pl. xii., fig. 31).



Fig. 3. *C. hartmeyeri*.

CRYPTOPLAX HARTMEYERI.

(Plate xii., figs. 14, 37, 38, 39.)

Cryptoplax hartmeyeri Thiele, Die Fauna Sudwest Austral, iii., 1911, 405, pl.

. Shark's Bay, West Australia. Type in Berlin Mus.

Not *C. hartmeyeri* Ashby.

Thiele differentiated this species from *burrowi* by means of the girdle

spicules which are longer and more slender and flattened. In addition the valves are a little differently spaced and the sculpture is more notable. We here reproduce Thiele's figures as Ashby has altogether misidentified the species, his specimen from Yallingup appearing from his indefinite photographs to belong to the form we have mentioned under *C. torresiana*.

[CRYPTOPLAX ROYANA, n.sp.]

(Plate xii., figs. 8, 16, 24.)

Size comparatively small, valves disconnected posteriorly, but not as much as those of *C. larvaeformis* of the same size. Fifth valve large, the last five being almost all the same size, elongate and narrow.

Colouration bright pink mottled with scarlet, anterior valve sometimes white, girdle white.

Anterior valve elongately semicircular, ornamented with longitudinal wrinkly lines wavy anteriorly.

Median valves with smooth dorsal area, wrinkly longitudinal lines, five in number on each side: juvenile sculpture shown by two nodules.

Posterior valve with mucro elevated, terminal, post-mucronal slope nearly perpendicular.

Girdle spicules long and pointed, striate.

Interior white. Posterior plate nearly perpendicular.

Dimensions: 29 x 7 mm.

Station: In crevices of coral rock.

Habitat: Lord Howe Island (Roy Bell).

Note:—While this Monograph excludes the Lord Howe Island Loricates generally, it is deemed desirable to insert the description of this new species here as it forms a connecting link between the southern and northern species].

EXPLANATION OF PLATES.

Plate ix.

- Fig. 1. *Acanthochiton bednalli* Pilsbry, whole shell.
2. *Acanthochiton bednalli* Pilsbry, anterior valve.
3. *Acanthochiton bednalli* Pilsbry, median valve.
4. *Acanthochiton bednalli* Pilsbry, posterior valve.
5. *Acanthochiton granostriatus* Pilsbry, whole shell.
6. *Acanthochiton granostriatus* Pilsbry, median valve.
7. *Acanthochiton granostriatus* Pilsbry, posterior valve from behind.
8. *Acanthochiton granostriatus* Pilsbry, posterior valve front view.
9. *Acanthochiton granostriatus* Pilsbry, posterior valve from side.
10. *Acanthochiton thackwayi* Ashby, whole shell.
11. *Acanthochiton thackwayi* Ashby, median valve.
12. *Acanthochiton complanatus* Hull, whole shell.
13. *Acanthochiton complanatus* Hull, anterior valve.
14. *Acanthochiton complanatus* Hull, median valve.
15. *Acanthochiton complanatus* Hull, posterior valve.
16. *Acanthochiton shirleyi* Ashby, whole shell.
17. *Acanthochiton shirleyi* Ashby, median valve.
18. *Acanthochiton shirleyi* Ashby, posterior valve.
19. *Acanthochiton shirleyi* Ashby, interior of.

20. *Acanthochiton macrocystialis* Ashby, whole shell.
21. *Acanthochiton macrocystialis* Ashby, anterior valve.
22. *Acanthochiton macrocystialis* Ashby, posterior valve.
23. *Acanthochiton macrocystialis* Ashby, median valve.
24. *Acanthochiton gatliffi* Ashby, whole shell.
25. *Acanthochiton gatliffi* Ashby, median valve.
26. *Acanthochiton coxi coxi* Pilsbry, whole shell.
27. *Acanthochiton coxi lachrymosus* May & Torr, anterior valve.
28. *Acanthochiton coxi lachrymosus* May & Torr, median valve.
29. *Acanthochiton coxi lachrymosus* May & Torr, posterior valve.
30. *Acanthochiton coxi coxi* Pilsbry, median valve.
31. *Acanthochiton pilsbryi* Sykes, whole shell (living).
32. *Acanthochiton pilsbryi* Sykes, whole shell (dried).
33. *Acanthochiton pilsbryi* Sykes, anterior valve.
34. *Acanthochiton pilsbryi* Sykes, median valve.
35. *Acanthochiton pilsbryi* Sykes, posterior valve.

Plate x.

- Fig. 1. *Acanthochiton sueurii* Blainville, whole shell.
2. *Acanthochiton sueurii* Blainville, median valve.
 3. *Acanthochiton sueurii* Blainville, posterior valve from side.
 4. *Acanthochiton sueurii* Blainville, posterior valve front view.
 5. *Acanthochiton kimberi* Torr, whole shell.
 6. *Acanthochiton kimberi* Torr, half median valve (W.A.).
 7. *Acanthochiton kimberi* Torr, median valve (N.S.W.).
 8. *Acanthochiton kimberi* Torr, median valve (S.A.).
 9. *Acanthochiton kimberi* Torr, posterior valve.
 10. *Acanthochiton kimberi* Torr, interior of posterior valve.
 11. *Acanthochiton kimberi* Torr, anterior valve.
 12. *Acanthochiton kimberi* Torr, interior of anterior valve.
 13. *Acanthochiton crocodilus debilior* Iredale & Hull, whole shell.
 14. *Acanthochiton crocodilus* Torr & Ashby, posterior valve.
 15. *Acanthochiton purpuratus* Hull, whole shell.
 16. *Acanthochiton purpuratus* Hull, posterior valve from side.
 17. *Acanthochiton purpuratus* Hull, posterior valve front view.
 18. *Acanthochiton wilsoni* Sykes, whole shell.
 19. *Acanthochiton sphenorhynchus* Iredale & Hull, whole shell.
 20. *Acanthochiton sphenorhynchus* Iredale & Hull, posterior valve.
 21. *Acanthochiton aenigma* Iredale & Hull, whole shell.
 22. *Acanthochiton aenigma* Iredale & Hull, median valve.
 23. *Acanthochiton aenigma* Iredale & Hull, posterior valve.
 24. *Acanthochiton curiosus* Iredale & Hull, whole shell.
 25. *Acanthochiton curiosus* Iredale & Hull, posterior valve.
 26. *Meturoplax retrojecta* Pilsbry, whole shell.
 27. *Meturoplax retrojecta* Pilsbry, median valve.
 28. *Meturoplax retrojecta* Pilsbry, posterior valve.
 29. *Meturoplax retrojecta* Pilsbry, posterior valve from side.
 30. *Meturoplax retrojecta* Pilsbry, interior of posterior valve.
 31. *Craspedochiton jaubertensis* Ashby, whole shell.
 32. *Craspedochiton jaubertensis* Ashby, anterior valve.
 33. *Craspedochiton jaubertensis* Ashby, median valve.

34. *Craspedochiton jaubertensis* Ashby, interior of posterior valve.
35. *Craspedochiton jaubertensis* Ashby, posterior valve from side.
36. *Craspedochiton jaubertensis* Ashby, posterior valve front view.

Plate xi.

- Fig. 1. *Notoplax costata* H. Adams & Angas, whole shell.
2. *Notoplax extra* Iredale & Hull, whole shell.
 3. *Notoplax gabrieli* Ashby, whole shell.
 4. *Notoplax macandrewi* Iredale & Hull, anterior valve.
 5. *Notoplax costata* H. Adams & Angas, anterior valve.
 6. *Notoplax gabrieli* Ashby, anterior valve.
 7. *Notoplax macandrewi* Iredale & Hull, median valve.
 8. *Notoplax costata* H. Adams & Angas, median valve.
 9. *Notoplax gabrieli* Ashby, median valve.
 10. *Notoplax macandrewi* Iredale & Hull, posterior valve.
 11. *Notoplax costata* H. Adams & Angas, posterior valve.
 12. *Notoplax gabrieli* Ashby, posterior valve.
 13. *Notoplax macandrewi* Iredale & Hull, posterior valve side view.
 14. *Notoplax costata* H. Adams & Angas, posterior valve side view.
 15. *Notoplax gabrieli* Ashby, posterior valve side view.
 16. *Notoplax subspiciosa* Iredale & Hull, posterior valve.
 17. *Glyptelasma m. matthewsi* Pilsbry, whole shell.
 18. *Glyptelasma m. occidentalis* Iredale & Hull, anterior valve.
 19. *Glyptelasma m. matthewsi* Pilsbry, median valve.
 20. *Glyptelasma m. occidentalis* Iredale & Hull, median valve.
 21. *Glyptelasma m. matthewsi* Pilsbry, posterior valve.
 22. *Glyptelasma m. matthewsi* Pilsbry, posterior valve side view.
 23. *Glyptelasma glypta* Sykes, whole shell.
 24. *Chorioplax grayi* H. Adams & Angas, whole shell.
 25. *Chorioplax grayi* H. Adams & Angas, anterior valve.
 26. *Chorioplax grayi* H. Adams & Angas, posterior valve.
 27. *Chorioplax grayi* H. Adams & Angas, median valve.
 28. *Chorioplax g. pattisoni* Ashby, whole shell.
 29. *Craspedoplax variabilis* Ashby, whole shell.
 30. *Craspedoplax variabilis* Ashby, anterior valve.
 31. *Craspedoplax variabilis* Ashby, half median valve.
 32. *Craspedoplax variabilis* Ashby, posterior valve.
 33. *Craspedoplax variabilis* Ashby, interior of unsplit posterior valve.
 34. *Craspedoplax variabilis* Ashby, interior of split posterior valve.
 35. *Craspedoplax elegans* Iredale & Hull, whole shell.
 36. *Craspedoplax elegans* Iredale & Hull, anterior valve.
 37. *Craspedoplax elegans* Iredale & Hull, median valve.
 38. *Craspedoplax elegans* Iredale & Hull, posterior valve.
 39. *Craspedoplax cornuta* Torr & Ashby, whole shell.

Plate xii.

- Fig. 1.—*Notoplax macandrewi* Iredale & Hull, whole shell.
2. *Notoplax subspiciosa* Iredale & Hull, whole shell.
 3. *Notoplax speciosa* H. Adams, median valve (N.S.W.).
 4. *Notoplax mayi* Ashby, median valve (N.S.W.).
 5. *Cryptoplax larvaeformis* Burrow, whole shell.

6. *Cryptoplax iredalei* Ashby, posterior valve from side.
7. *Cryptoplax striata* Lamarek, posterior valve from side.
8. *Cryptoplax royana* Iredale & Hull, posterior valve from side.
9. *Cryptoplax mystica* Iredale & Hull, posterior valve from side.
10. *Cryptoplax larvaeformis* Burrow, posterior valve from side.
11. *Cryptoplax iredalei* Ashby, whole shell.
12. *Cryptoplax striata* Lamarek, whole shell.
13. *Cryptoplax burrowi* Smith, whole shell.
14. *Cryptoplax hartmeyeri* Thiele, whole shell.
15. *Cryptoplax striata* Lamarek, posterior valve.
16. *Cryptoplax royana* Iredale & Hull, posterior valve.
17. *Cryptoplax larvaeformis* Burrow, posterior valve.
18. *Cryptoplax iredalei* Ashby, posterior valve.
19. *Cryptoplax mystica* Iredale & Hull, interior of posterior valve.
20. *Cryptoplax striata* Lamarek, interior of posterior valve.
21. *Cryptoplax mystica* Iredale & Hull, posterior valve.
22. *Cryptoplax mystica* Iredale & Hull, median valve.
23. *Cryptoplax mystica* Iredale & Hull, whole shell.
24. *Cryptoplax royana* Iredale & Hull, whole shell.
25. *Cryptoplax larvaeformis* Burrow, anterior valve.
26. *Cryptoplax iredalei* Ashby, anterior valve.
27. *Cryptoplax mystica* Iredale & Hull, whole shell, juvenile.
28. *Cryptoplax larvaeformis* Burrow, whole shell, juvenile.
29. *Cryptoplax striata* Lamarek, whole shell, juvenile.
30. *Cryptoplax iredalei* Ashby, whole shell, juvenile.
31. *Cryptoplax burrowi* Smith, posterior valve.
32. *Cryptoplax burrowi* Smith, posterior valve, *error*.
33. *Cryptoplax mystica* Iredale & Hull, posterior valve, juvenile.
34. *Cryptoplax iredalei* Ashby, posterior valve, juvenile.
35. *Cryptoplax larvaeformis* Burrow, posterior valve, juvenile.
36. *Cryptoplax striata* Lamarek, posterior valve, juvenile.
37. *Cryptoplax hartmeyeri* Thiele, anterior valve.
38. *Cryptoplax hartmeyeri* Thiele, median valve.
39. *Cryptoplax hartmeyeri* Thiele, posterior valve.

ERRATUM:—An error occurred in the text title of the shrimp figured on plate 1, Part 1. This crustacean is the common Sydney school prawn, and is not found in New Zealand "waters," but is sold in the "markets" of the Dominion. The author of the article spoke of "our examples," and, as he is a New Zealander, the error is easily explainable. This prawn belongs to the genus *Metapenaeus*, and its variable rostrum is well known. It is therefore not entitled to the specific or subspecific distinction suggested by Mr. Phillips; further the name *haswelli* is preoccupied.

NOTES ON THE SEALS FOUND IN AUSTRALIAN SEAS.

By A. S. LE SOUEF, C.M.Z.S.

(Plates xiii.-xv.)

Reference to the early history of Australia shows that we once had a very abundant seal fauna, and that our first commercial asset was a large export of seal skins and oil. Between the years 1798 and 1826 British, French and American vessels came to collect the spoil (1). During this time of heedless destruction the Sea Elephant (*Mirounga leonina*), which then existed on King Island, was exterminated in our local waters, and only a scattered remnant is left of one of our fur seals (*Arctocephalus forsteri*).

Owing to the seals being under the jurisdiction of the several southern States, each being responsible for those found on their respective coasts, no systematic survey has been made, and we have little reliable information regarding their numbers, range and habits. With a view to learning something of this group, every opportunity has been taken by the writer to study them during the past few years; several trips have been made to islands inhabited by seals off the coast of New South Wales, and information gathered from various sources. The result has been apparently to record the occurrence in our seas of the New Zealand Fur Seal (*Arctocephalus forsteri*), hitherto only known from the Dominion, and to throw a little light on the habits of the Australian Fur Seal. The latter species has generally been referred to in literature as *Otaria cinerea* Peron, but as the species to which Peron actually gave this name was doubtless a hair-seal, I shall use the name *Arctocephalus doriferus* Wood Jones (2).

The value of our fur seals does not appear to have been realised. The protection afforded them by the States is more nominal than real, and only in Tasmania is any effort made to utilise them commercially. That they are worth attention is shown by the following letter from Messrs. Wilcox Mofflin, Ltd.

Dear Sir,—At your request we have examined skins of the New Zealand Fur Seal taken from King Island and the Australian Bight, and also of the Australian Fur Seal from Julia Percy Island, and have pleasure in stating that these pelts are of good quality, the under fur being fine and dense. The finest Alaskan furs are taken from three-year-old bulls, and as the pelts we examined were from females, they probably would not represent the same quality obtained from young bulls of the species named.

We cannot make an estimate of the value of the skins without having them made up, but we should think that they would be worth not less than 50 per cent. of the best Alaskan furs, and may be of equal value.—Yours faithfully,

WILCOX, MOFFLIN, LTD. (Signed) L. M. TRIGGS, Director.

A. S. Le Souef, Esq., Taronga Zoological Park Trust.

(1) Murihiku; McNab, 1909.

(2) Rec. South Aust. Mus., iii., 1925, p. 9.

In Australian seas one may identify five species of seals as follows:—

(A). Crab Eating Seal, *Lobodon carcinophaga* Hombron and Jacquinot. This is only a stray from the Antarctic, one being recorded from Port Phillip in July, 1897, while another was found at Portland, Victoria, in January, 1894.

(B). Leopard Seal, *Ogmorhinus leptonyx* Peters. This species is another visitor from the Antarctic, and is fairly numerous in our waters in winter.

(C). The New Zealand Fur Seal, *Arctocephalus forsteri* Lesson. Found on King Island, Bass Strait, and on the islands of the Recherche Archipelago, South-western Australia, and probably other places.

(D). The Australian Fur Seal, *Arctocephalus doriferus* Wood Jones. The most numerous of our seals; found in South-eastern Australian seas from Seal Rocks, north of Port Stephens, N.S. Wales, to Julia Percy Island, Victoria, and perhaps on Casuarina Island, off Kangaroo Island, South Australia.

(E). The Australian Hair Seal, *Arctocephalus albicollis* Peron, which should now be known as *Arctocephalus cinereus* Peron, according to Wood Jones. It is found, as far as I know, from Dangerous Reef, Spencer's Gulf, S.A., to Houtman's Abrolhos, W.A.

Leopard Seal, *Ogmorhinus leptonyx* Peters.

The Leopard Seal apparently extends as far north as latitude 35°S. in winter, as it is often recorded from the coast of New South Wales in August and September; the farthest northern record that I can trace is of a specimen taken from the Hawkesbury River. In August, 1921, after a severe gale lasting a fortnight, no less than five of these animals were found on different parts of the coast. They include sea birds in their dietary; one taken at Manly in 1921 had the remains of Mutton Birds (*Puffinus*) in its stomach, and another killed at La Perouse in 1925 had eaten a penguin. Referring to this species Senior-Constable Knight, of King Island, states in a letter dated 25th July, 1925, "These are often found on the beach sick from eating birds, mostly penguins, and are bound up with feathers. After rolling about on the beach for some time, they get rid of a quantity of feathers, and are all right again and return to the water." Senior-Constable W. J. Mansfield in a letter from Flinders Island, Bass Strait, dated 17th May, 1924, states that he has "seen a fair amount of the Sea Leopard, which is frequently found washed up on the various islands in winter time." It is noticeable that all which come ashore on the New South Wales coast are injured or sick; some are severely cut about, and others, though showing no sign of injury, are completely exhausted and soon die. All I have personally seen have been females, though the one which appears in the photograph (Plate xiii.) was reported to be 10 feet long, and has the appearance of a male.

The New Zealand Fur Seal, *Arctocephalus forsteri* Lesson.

This species, I believe, can now be definitely recorded from Australian seas, as the skin and skull of a specimen collected from King Island in June, and two from the Recherche Archipelago in April, 1925, are now in the Australian Museum and are tentatively identified as this species. As far as can be gathered the species is very scarce in our waters, though possibly it has been confused with the Australian Fur Seal and therefore has not been recognised. In a letter dated 17th May, 1925, Senior-Constable W. J. Mansfield, of Flinders Island, says: "The Sea Bear or Fur Seal is no doubt the true Fur Seal. It used to live and breed on Saltpetre Rocks, on the western side of King Island, but they are not so numerous as *Otaria cinerea* [= *A. doriferus*], and were hunted by the sealers until they were almost extinct; there have not been any of them captured, as

far as I can ascertain, for the past 30 years. It was known to the sealers here as the Black Seal, and they state that it has a beautiful thick soft fur, and its habits are similar to *O. cinerea*, and used to have its young at the same time." In a letter dated 11th June, 1924, Mr. F. Lewis, chief inspector of fisheries and game, Victoria, states that "he has been informed by fishermen that there are about 100 seals on King Island, which are locally known as the Black Seal. Senior-Constable Knight, of King Island, was kind enough to interest himself in the matter, and under a special permit issued by the Tasmanian Government, procured one specimen of the local Black Seal, which, on examination of the teeth, I considered to be *Arctocephalus forsteri*. Two specimens were also obtained in the open season from the Recherche Archipelago by Captain Douglas in 1925. Regarding this species in the Great Australian Bight, Mr. W. R. Barwick writes under date 2nd September, 1924, "When speaking recently to the Hon. Cuthbert McKenzie, M.L.C. I gleaned the following information regarding their description. Mr. McKenzie states that they are smaller than the hair seal, very active and swift in the water. When wet they are black and shiny, and dark brown when dry; the nose is sharp, resembling that of a fox, ears small and pointed. . . . The animals are very timid; they haunt only the most rugged spots, isolate themselves, and do not habit with the fur seal. They have their own rockeries and generally pup about November."

The Australian Fur Seal, *Arctocephalus doriferus* Wood Jones.

This seal is the common species of south-eastern Australian waters, and is apparently the species which exists in numerous colonies from Seal Rocks, near Port Stephens, N.S. Wales, to the islands of Bass Strait, and on Julia Percy Island, off the south-west coast of Victoria. Mr. F. Lewis, Chief Inspector of Game and Fisheries, Victoria, in a letter dated 11th June, 1924, states that there are four colonies of seals in strictly Victorian waters, namely, Julia Percy Island in the west; Seal Rocks off Western Port; the Glennies and the Anser Groups near Wilson's Promontory, and a small colony at the Skerries, at the mouth of the Wingen River in eastern Victoria. He further mentions that the two first-named are fairly large colonies, probably 3,000 or 4,000 seals at each place. Inquiries made from fishermen operating crayfish pots in Bass Strait seem to show that there are a good number of colonies between Victoria and Tasmania, the chief of which are White Rock, S.W. of Shooting Island, about 100 seals; Council Rock in Banks Strait, about 150; South West Isle, Kent Group, about 200; Barrenjoie, east of Launceston Heads, about 200; West Moncur, east of Wilson's Promontory, about 300; Hogan Group, about 300; Read's Rocks, east of King Island, 1,500 to 2,000. Captain Colin McDonald estimates that there are about 600 seals on the Anser Group. Senior-Constable Mansfield, of Flinder's Island, puts the number of seals on Council Rock at 1,800 to 2,000, and thinks that there are about 1,000 on Barrenjoie. To this list we can add the seals on Seal Rocks, near Port Stephens, estimated at 500 animals.

Observations tend to show that the main herds keep to their respective bases throughout the year, but that small herds, consisting chiefly of bull seals, make fairly long journeys. Senior-Constable W. J. Mansfield, of Flinder's Island, writes to the effect that the seals on Barrenjoie and Council Rock "remain there all the year round, only leaving to go fishing for food." Mr. W. H. Williams, who was lighthouse keeper at Seal Rocks, Port Stephens, for about 20 years, states that he thinks the seals are about in the same numbers throughout the year. Herds occasionally visit Montague Island, off Narooma, New South Wales. A fairly large herd, estimated at about 200 animals, arrives there every year in

August and leaves again early in November, and smaller groups, of from 10 to 20, return in midsummer, and leave in the autumn. Mr. W. H. Williams, now lighthouse keeper at Montague Island, has given the following memorandum of their comings and goings during 1924-5: "The main herd, about 200 altogether, returned in August, 1924, and left again in November; about 20 came in January, 1925, and left about the middle of March, only one remaining; on May 20th about 10 returned, and the main herd came back in August." I visited the Island in February, 1924, when 20 seals were noted. These, with two exceptions, were all bulls. The main herd was observed in September, 1925, when upwards of 100 animals were present; these again were with three or four exceptions, large bulls. I cannot say where these seals come from, though one would suspect that they are part of the herd based on Seal Rocks, about 300 miles to the north. The head lighthouse keeper at Seal Rocks reports that there has been apparently no lessening in the numbers of seals on the rocks between July and September, 1925. Seals have been seen as far north as Crowdy Head, New South Wales, and stray animals have at times visited the vicinity of Eden (Twofold Bay).

The food of these seals is very variable, though in the main it consists of fish that are of little or no commercial food value. Senior-Constable Mansfield states that they take various kinds of fish, including Barracouta, and the jaw bones of these were found on the seal rookeries. Edward Mansell stated that he had found a seal's stomach full of Jellyfish, and another informant has taken 13 salmon (a large mullet) from a seal. Two seals opened at Montague Island were found to contain (1) 13 Porcupine Fish, 2 Flathead, 1 Red Rockcod, 1 Stingray; (2) 7 Stingray, 1 Morwong, 1 Flathead. I have frequently timed a seal under water and have never seen one stay away from the air for longer than 40 seconds; it would therefore not be possible for seals to reach fish in deep water. A fisherman at Seal Rocks saw a seal throwing a Stingray up in the air, until the fish ultimately came to pieces, and was swallowed.

These seals have a peculiar habit of holding one flipper high in the air when lying on the surface of the water; this probably serves to keep them head-on to the wind and sea. In a dead calm a seal often lies on its back in the water, and brings the hind flippers over to meet one fore flipper, and thus floats in a bow-shaped position. When sleeping in the water the body is relaxed and the head hangs under water for about 40 seconds in repose, being raised for 5 seconds to breathe: a seal has been noted to thus obtain broken sleep for upwards of an hour. When in the Arctic Stefansson observed that *Phoca hispida* slept in the same way on the ice, the average length of the nap being 30 seconds, and the periods of waking 5 seconds (Hunters of the Great North, 1923, p. 256). When on shore, however, they may sleep soundly, though one or two of a herd raise their heads occasionally to look round for enemies. Individuals of a herd have no "esprit de corps" for, if danger is seen by one animal, it will not warn the rest but quietly gets away. I have seen this happen on several occasions, but notably once when sitting quietly on a rock overlooking the herd on Montague Island, one seal suspecting that I was not part of the landscape moved up to make sure, and then turned and made quietly out to sea, leaving the others quite undisturbed. On land they are rather timid.

The males are extremely fussy and quarrelsome among themselves, but show great deference to the females. When a bull comes in from the sea to take up a position on the rocks, every other male in the vicinity noisily disputes his progress, but if a female should join the group, she is not only allowed a free passage, but she will select a dry coated male, and proceed to squeeze the excess moisture out of her coat against his body, and without any protest being raised she may even go to sleep, using the big chap as a pillow.

Seals are very playful and thoroughly enjoy romping in the waves, sometimes jumping right out of the water, apparently just for the fun of it. When visiting Seal Rocks during a southerly gale, I could see those which happened to be in the water holding a regular surfing carnival. They would ride up to the island on the top of an enormous wave, and just before it crashed against the rocks they would turn a back somersault and slide down the back of the comber, in a sort of water switchback. When tired of this they would land on the rocks and clamber up to a place of safety before the next wave thundered against the sides of the island.

Arctocephalus doriferus is polygamous. When at Seal Rocks on the 6th of November, 1923, I found the centre of the island occupied by several small groups of females, numbering from 6 to 25 animals; each lot was presided over by an enormous bull, who continually waddled round his sphere of influence. There were no pups at that date. The two ends of the island were occupied by a number of bulls of all ages, among which there was a good deal of fighting and quarrelling.

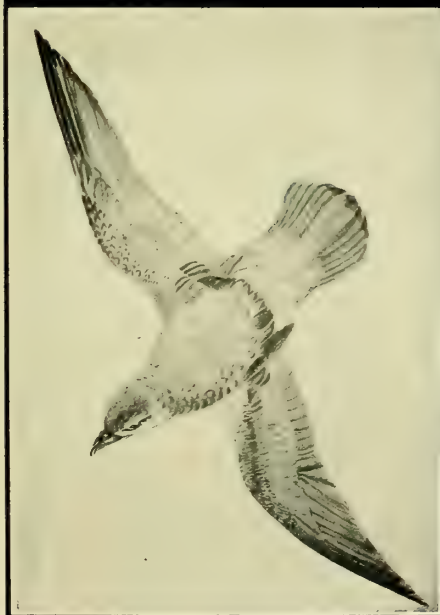
Normally, this species makes three kinds of sound. The first is a loud, full throated call, like the bawl of a calf; the next is a series of short barks, which are uttered as a protest against the too close approach of another seal; if this protest is to be enforced the voice changes to a deep coughing growl. The call of the young is a single bleat like the cry of a lamb.

Australian Hair Seal, *Arctocephalus albicollis* Peron (= *A. cinereus* vide Wood Jones.)

This species is found in south-eastern Australian waters, appears to be fairly numerous on many islands in the Great Australian Bight, and extends its range as far north as the Houtman's Abrolhos, off Geraldton, Western Australia. Mr. W. D. Walker in a letter dated 20th February, 1923, states that "The common Hair Seal abounds in the Neptune Group on Pearson's, Evans', Price and Goat Islands. They are comparatively tame, very inquisitive, and may be touched if the observer is sufficiently patient, and, in fact, if approached too near in the case of the cows and young, the old bulls will show vigorous fight. They bask asleep in the sun, usually alongside and partly immersed in small salt water pools. They bark like dogs and are very slow and cumbersome on land, but quick in the water. They will leap or fall 20 feet from rock to rock when making for the sea when frightened."

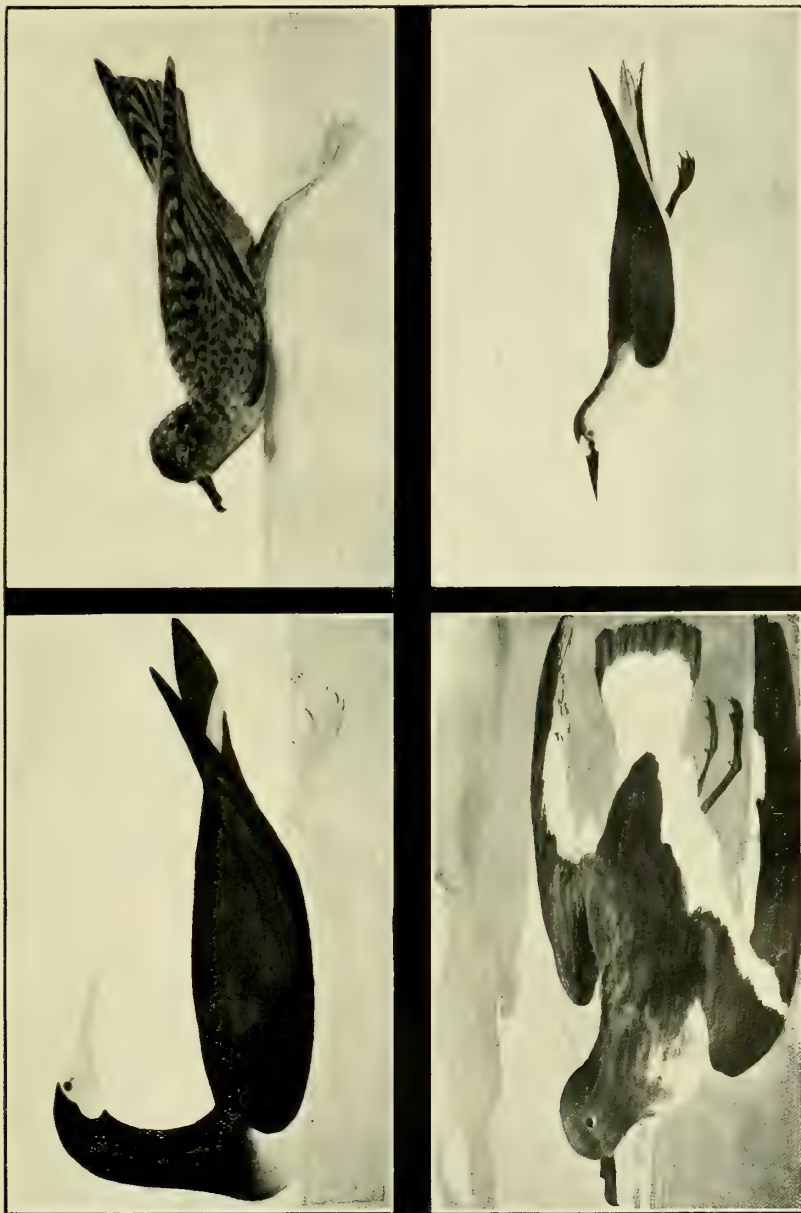
Note:—Reference may be made to the strong appeal by Dr. G. Dallas Hanna, of the California Academy of Sciences, for the protection of the Fur Seal herds of the Southern Hemisphere, published in this journal, Vol. iii., p. 11. The very definite opinion as to the commercial value of our fur seals expressed by Messrs. Wilcox Mofflin, Ltd., is interesting in view of the experience of the Western Australian branch of that firm in relation to a shipment of skins exported in 1921, and which, I was informed, realised far less than they cost to procure. It was then suggested that the impossibility of having the skins treated by Russian experts was the real reason for the low price realised. It is clear, however, that at the present date skins of our Australian fur seals have a substantial commercial value. They are practically unprotected in Western Australia, and the measures of protection in other States appear to require revision. Now is the time for the Commonwealth Government to step in and regulate the taking of seals in any of the Australian seas. Perhaps a close season could be proclaimed for two or three years, during which time a survey of the herds could be undertaken, and regulations framed accordingly.—Editor.

GEORGE FORSTER'S PAINTINGS.



1. Norfolk Island Robin.
3. Broad-billed Prion.

2. Norfolk Island Pigeon.
4. Blue Petrel.



1. Booby Gannet.
3. Antarctic Petrel.

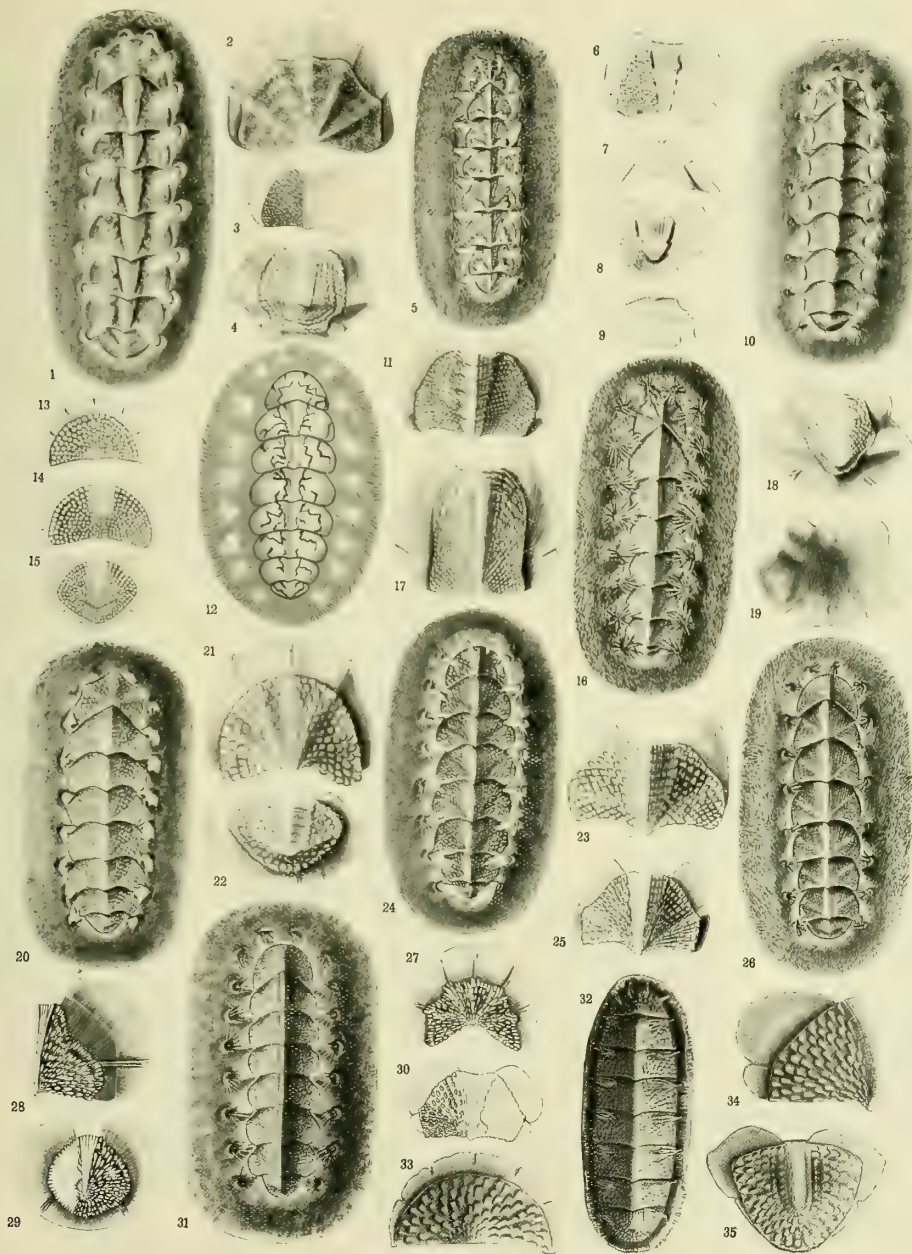
2. Long-winged Black Petrel.
4. Wideawake Tern.

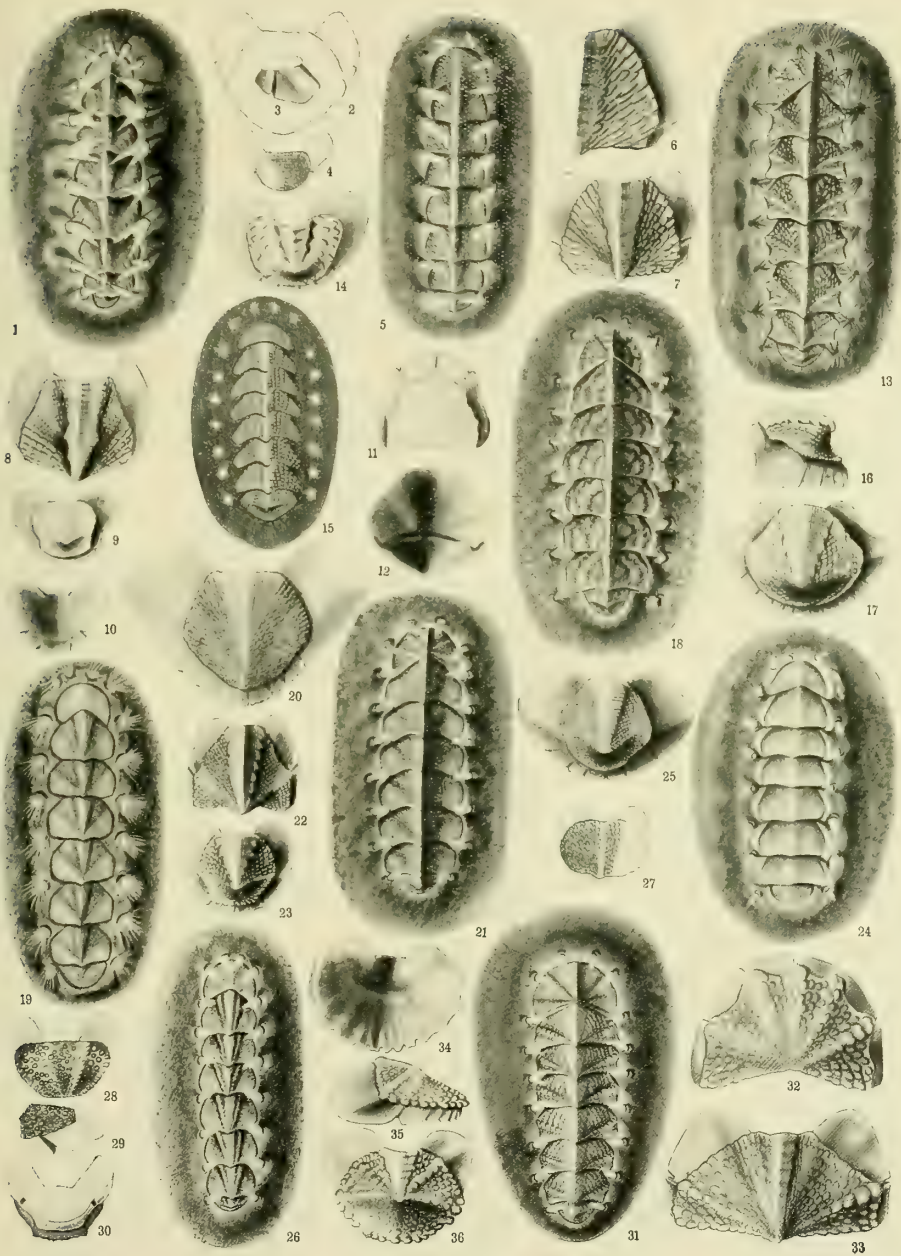
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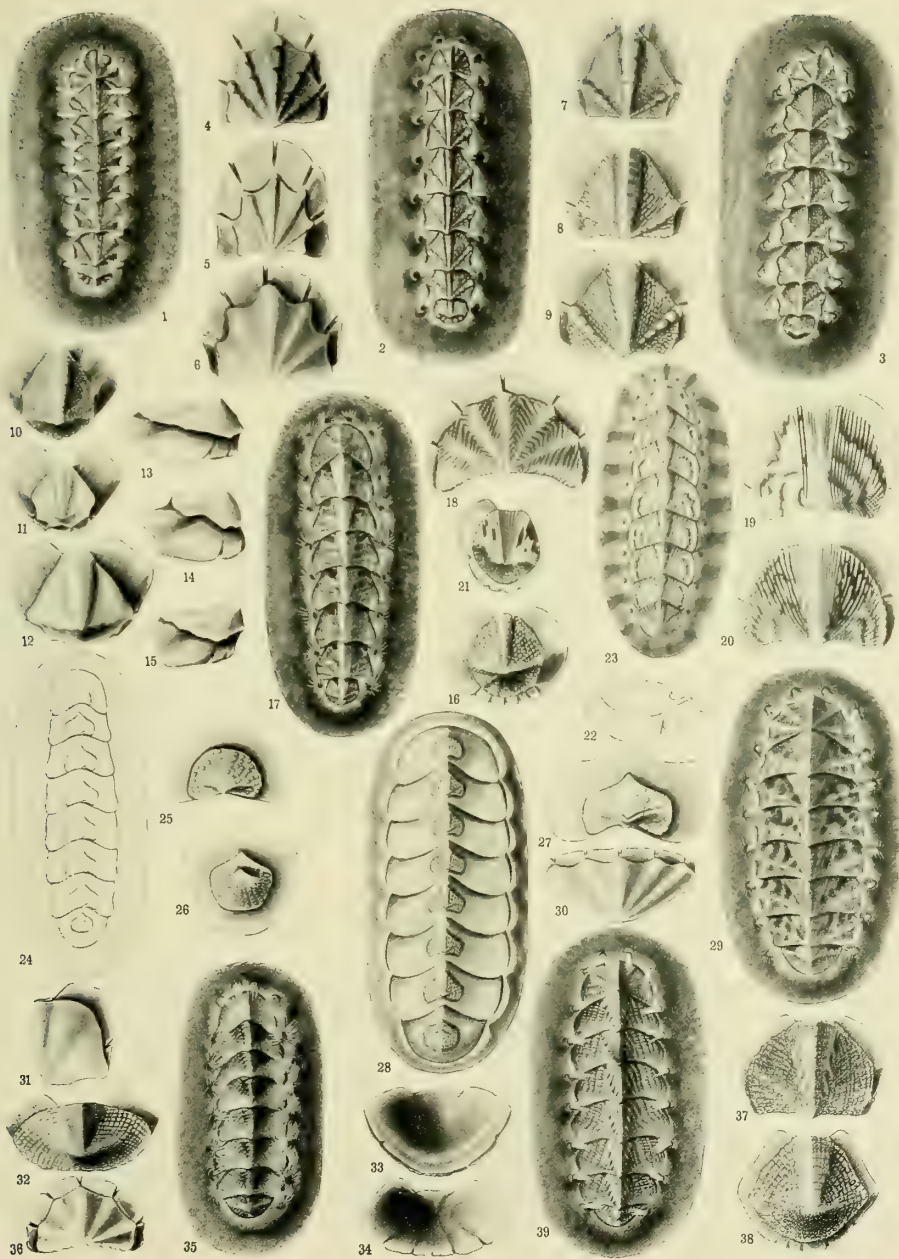


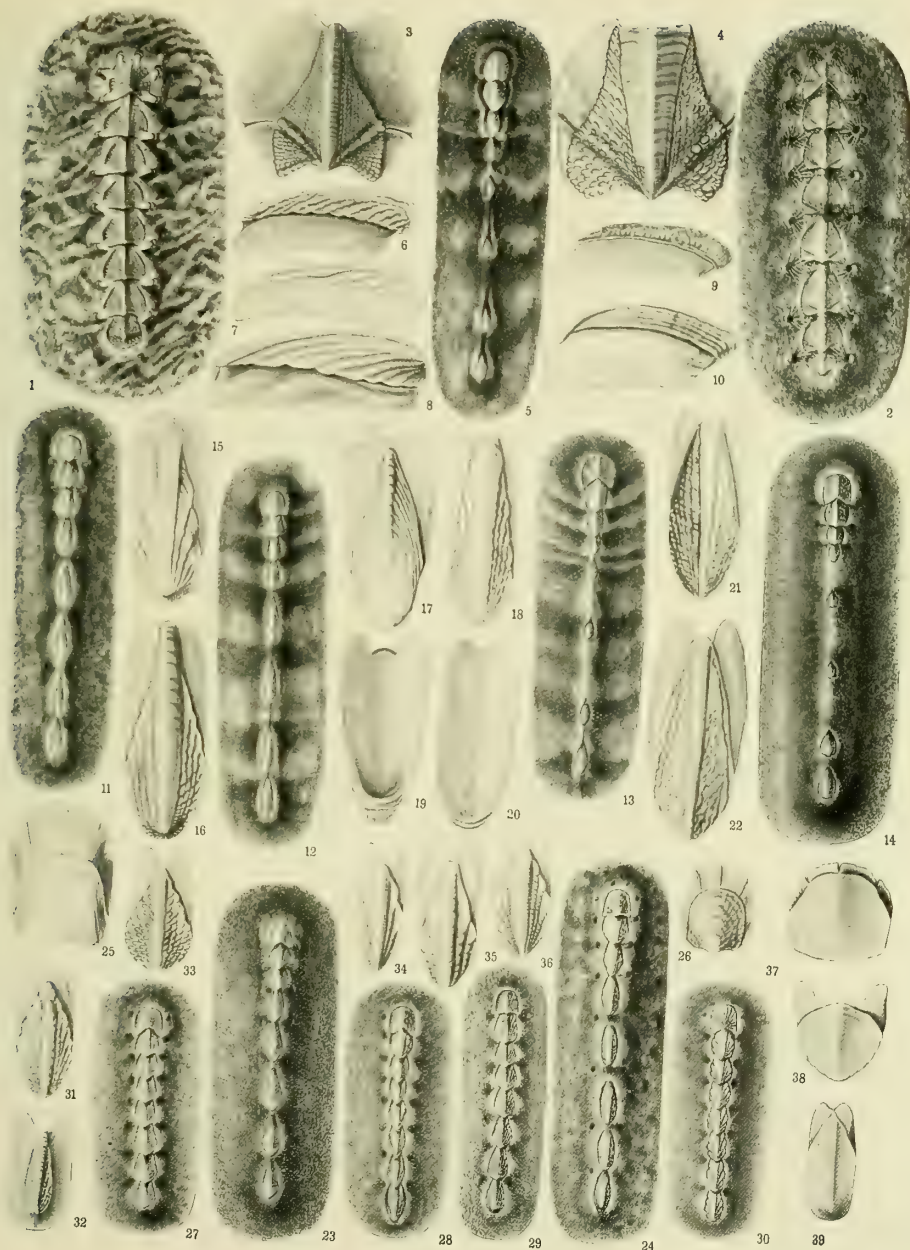
2. Light-mantled Sooty Albatross.
4. Antarctic Fulmar.

1. Snowy Albatross.
3. Snowy Petrel.



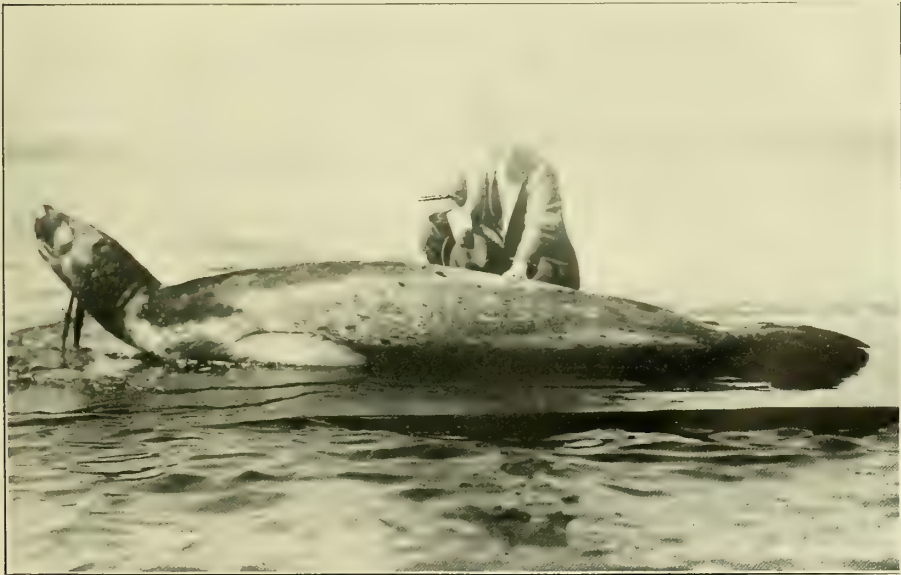








The Australian Hair Seal; female and young.
Photograph by W. D. Walker.



Leopard Seal.
Photograph by F. Kimbel,



The Australian Fur Seal. Group of bulls on Montague Island; the animal on the right is the sentinel.



Australian Fur Seals making for the water. Montague Island.



Herd of Australian Fur Seals resting in the water with their flippers in the air.
Montague Island.



Young Australian Fur Seal.

Photograph by Harry Burrell.



Group of Australian Fur Seals in Taronga Park.

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A CHECK LIST OF THE AUSTRALIAN TENEBRIONIDAE

By H. J. CARTER, B.A., F.E.S.

Plates xvi. and xvii.

Preface.

The Catalogue of Australian Coleoptera published by Masters in 1886 enumerated 127 genera and 512 species of TENEBRIONIDAE. Of these 29 genera and 87 species have since been sunk as synonyms or shown not to refer to Australian insects, leaving 98 valid genera and 425 valid species. The subfamilies in this family were omitted by Masters.

The present check-list contains the names of 28 subfamilies, 169 genera and 1,085 species, an increase of 72 per cent. in the genera and of 155 per cent. in species.

The growing importance of entomology in the economics of agriculture; its co-ordination with other fields of natural history; the vast numbers of insects to be studied by the modern entomologist make it highly desirable that museums and scientific students should have the readiest access to accurate information, to which end a correct catalogue is indispensable.

In this check-list I have not used the faunal subdivisions given by Sloane in his check-list of CARABIDAE [Proc. Linn. Soc. N.S.W., 1905, Suppl.].

The exact locality, where known, is given for species which appear to have a limited habitat. Where the State only, or more than one State is mentioned, a wider range may be inferred.

The large number of apterous forms and the sluggish habits of the TENEBRIONIDAE give them a special value in zoo-geography. The general facts as to the origin of the Australian fauna—established by the evidence of Tate, Spencer and Hedley in general zoology and by Sloane* and Tillyard in entomology contain much confirmatory evidence in the study of this group. Of the 169 genera in the following list no less than 128—or more than 75% are endemic, and include the large genera especially characteristic of our inland fauna, e.g., *Helaeus*, *Saragus*, *Nyctozoilus* and *Adelium* with their allies. Of the remaining genera, seven contain cosmopolitan grain pests—viz.: *Alphitophagus*, *Gnathocerus*, *Latheticus*, *Palorus*, *Sitophagus*, *Tenebrio* and *Tribolium*, while the following table shows the distribution of genera that are not limited to Australia.

The two largest and most widely distributed groups, the *Helaeinae* and the *Adelinae* (the former wholly, the latter almost entirely confined to Australia) include 443 species, or 41% of the total. Again, of the 85 subfamilies in Gebien's world list no less than 57 (or 67%) are unrecorded from Australia. A brief comparison of the world's TENEBRIONIDAE, in fact, shows this family to be one of the most characteristic local elements of a natural fauna.

There is some evidence of a relation of our TENEBRIONIDAE with those of Oceania. *Scotoderus aphodioides* Pasc. is found in New Caledonia and Wallis Island; *Platydema striatum* Montr. in New Caledonia and Lord Howe Island;

* Especially see Proc. Roy. Soc. Vic. 1915, Part i,

both having a wide distribution in eastern Australia. One species of *Diphyrrhynchus* occurs in New Zealand; while many of our genera—especially of the *Adelinae*—show a great convergence with Pacific Island forms—*Hydissus* (*Meneristes*) *curtilus* Oll. and *H. vulgaris* Oll. from Lord Howe Island are closely related to our common *H. feronioides* Pasc.

The Indo-Malayan immigration is well marked in the more brilliant metallic beetles like *Amarygmus*, of which the nearest ally, *Chalcopterus*, is the most numerous genus of Australian TENEBRIONIDÆ—as well as forms like *Ceropria*, *Leiochrodes*, and the fine groups of *Cyphaleinae* and *Cnodaloninae*. One species of *Promethis* has a doubtful record from India. A pertinent fact in this connection comes from a late publication, "Résultats de l'expédition Scientifique Néerlandaise à la Nouvelle Guinée, Tenebrionidae," 1920. Of the 64 genera here recorded by Gebien for this island no less than 31 are in the Australian list, while the following—besides five cosmopolitan species—occur on both sides of Torres Strait:—

Mesomorphus vitiger Blanch.

Bradymerus crenatus Pasc.

B. raucipennis Blk.

Ceropria peregrina Pasc.

C. maculata Geb.

Leiochrodes suturalis Westw.

Dioclina nitida Cart.

Palorus austrinus Champ.

Setenis sulcigera Boisd.

Encyalesthus atroviridis Mael.

Toxicum punctipenne Pasc.

Espites basalis Pasc.

Chariothes planicollis Fairm.

Amarygmus morio F.

Chalcopterus bellus Blackb.

C. modestus Blackb.

There is little doubt but that further researches in the Papuan fauna will result in the discovery of analogous occurrences.

It is more difficult to trace species having Antarctic origin or affinity. Probably some of the Tasmanian genera and those which range from Tasmania along the Alpine regions of Victoria and New South Wales, come under this category, e.g., *Cotulades*, *Brycopia*, the purely Tasmanian *Edylius*, *Enneboeus*, *Melytra*, *Phaennis* and the moss-beetles *Mnionophilus* and others.

With American TENEBRIONIDÆ there is little connection—*Adelium sulcatulum* Fairm. is a solitary Chilean representation of one of our principal groups. But the most remarkable connection with American fauna occurs in the case of *Tretothorax cleistostoma* Lea—a species found in ants' nests in N. Queensland—the single member of a group of which the four otherwise known representatives are all American—their habitats being respectively California, Texas, San Domingo and Colombia. These extraordinary insects form a separate subfamily, and are so different from anything in the whole race of TENEBRIONIDÆ—that the describer of the Australian species—as also the late veteran entomologist, Canon Blackburn—placed it in a new family (TRETOTHORACIDÆ). Our ocean beach fauna contains species with a wide range. Thus *Caedimorpha heteromera* King is as common at Fremantle as in the Sydney district; *Caedius sphaeroides* Hope ranges from Queensland to Western Australia, while the genus *Trachyscelis* is of world-wide distribution.

The most numerous genera in our list are the following:—

Chalcopterus, 110 species. Widely spread.

Pterohelacus, 82 species. Widely spread.

Cardiothorax, 64 species. Confined to Eastern Australia.

Adelium, 62 species. Widely spread.

Saragus, 56 species. Widely spread.

Amarygmus, 55 species. Widely spread.

Helaeus, 48 species. Chiefly central and western.

While *Seiratrana*, *Licinoma* and *Brycopia*—all closely related to *Adelium*—include 73 species between them.

The following genera have disappeared from Australian lists since the date of Masters' catalogue:—

- Emeax* Pasc. = *Nyctoporis* Esch.
Pseudocædius Blkb. = *Sobas* Pasc.
Prionotus Muls et Rey = *Achora* Pasc.
Apostethus Pasc. = *Adelodemus* Haag.
Opatrum F. (Aus. spp.) now *Gonocephalum* Chev.
Isostira Pasc. = *Bradymerus* Perr.
Ecripsis Pasc. = *Ammidium* Er.
Phycosecis Pasc. (now *Trogositidae*).
Ulodica Pasc. = *Uloides* Er.
Latometus Er. = ? *Colydiidae*.
Typhobia Pasc. = *Platydema* Cast et Br.
Hoplocephala Cast et Br. = *Arrhenoplita* Aus. spp. probably *Pentaphyllus* Latr.
Acthosus Pasc. = *Uloma* Cast.
Lindia Blkb. = *Lyphia* Muls.
Saragodinus Bates = *Dysarchus* Pasc.
Chileone Bates = *Hypaulax* Bates.
Nyctobates Guér. Aus. spp., now *Setenis*.
Ephidionius Pasc. = *Brises* Pasc.
Tyndarismus Pasc. = *Lepispilus* Westw.
Augolesthus Motsch. = *Chariotheca* Pasc.
Dechius Pasc. = *Scotoderus* Perr.
Microphyes Mael. = *Alphitobius* Steph.
Moerodes Waterh. = *Prophanes* Westw.
Apomestris Bates = *Altes* Pasc.
Decialma Pasc. = *Olisthaena* Er.
Tetraphyllus Cast et Br. (Aus. spp. now *Hemicyclus* Westw.).
Dinoria Pasc. = *Brycopia* Pasc.
Pseudhelops Guér. (Aus. spp. now *Coripera* Pasc.).
Arcothymus Pasc. (a New Caledonian genus).
Mimopeus Pasc. = *Cilibe* Breme. [*M. amaroides* Pasc. = *Cilibe elongata* Br. N.Z.].
Cymbeba Pasc. A New Caledonian genus.
Eurypera Pasc. = *Amarygmus* Dalm.

GENERA NOT LIMITED TO AUSTRALIA.

	Occurring also in						Occurring also in				
	Europe.	Asia.	Africa.	America.	Oceania.		Europe.	Asia.	Africa.	America.	Oceania.
<i>Alphitobius</i> ..	*			*	*	<i>Chariotheca</i>		*			*
<i>Amarygmus</i> ..		*	*	*	*	<i>Cosyphus</i> ..	*	*	*		
<i>Anemia</i> ..		*	*	*		<i>Crypticus</i> ..	*	*	*	*	
<i>Bradymerus</i> ..		*	*		*	<i>Derispia</i> ..		*			
<i>Byrsax</i> ..		*			*	<i>Diphyr-</i>					
<i>Cædius</i> ..		*	*		*	<i>rhyncus</i> ..		*			*
<i>Ceropria</i> ..		*	*	*	*	<i>Enneboeus</i> ..				*	

	Occurring also in					Occurring also in				
	Europe.	Asia.	Africa.	America.	Oceania.	Europe.	Asia.	Africa.	America.	Oceania.
<i>Encyalesthus</i>		*					*			
<i>Gonocephalum</i>	*	*	*	*						
<i>Hoplocephala</i>		*	*	*	*					
<i>Hypophloeus</i>	*	*	*	*						
<i>Lepispilus</i> ..		*								
<i>Leiochrodes</i> ..		*	*		*					
<i>Lyphia</i>	*	*	*							
<i>Menephilus</i> ..	*	*	*							
<i>Mesomorphus</i>		*	*							
<i>Pentaphyllus</i>	*	*	*	*						
<i>Platydemia</i> ..	*	*	*	*	*					
						<i>Promethis</i> ..	*			
						<i>Pseudostrongylium</i>			*	
						<i>Scotoderus</i> ..				*
						<i>Setenis</i>	*			*
						<i>Strongylium</i>	*		*	
						<i>Tarpela</i>	*		*	
						<i>Thesilea</i>	*			*
						<i>Toxicum</i>		*		*
						<i>Trachyscelis</i>	*		*	
						<i>Uloma</i>	*	*	*	*

"Je ne m'entendrais pas sur les difficultés exceptionnelles qui présente la classification de cette famille; elles sont connues de tous les entomologistes qui ont abordé son étude." Lacordaire, Col. v., p. 12, "Il est presque inutile de dire que les caractères inscrits dans le tableau suivant, qui m'a coûté beaucoup de peine, ne s'appliquent qu'à la généralité des espèces de chaque tribu." i.e., p. 290, Lacordaire (1859).

"This family contains a large number of genera, possessing in common very few characters, yet linked together by such gradual changes in structure that their classification presents almost insuperable difficulties. The division into tribes can scarcely be exhibited in a tabular form, on account of the varied relations exhibited by the members of some of the tribes." Leconte and Horn. "Col. of N. Amer.," p. 359 (1883).

The above quotations will, I trust, to some extent excuse the weakness in some of the links in the tabular chain I have tried to forge. Intended as a guide to students of our Coleoptera, it has been to some extent adapted from the works of the authors quoted above.

The term subfamily has been employed in order to facilitate the use of the key with the classification adopted in the Junk Catalogue of Tenebrionidae, edited by Hans Gebien, the European authority on the family.

The large additions made to the genera and species since Lacordaire's work appeared, together with the increased knowledge available has led to changes—a few of which are indicated below. At the same time the general arrangement and, in great part, the lesser details remain as Lacordaire gave them—a striking testimony to his grasp of the subject.

I have used to some extent Lacordaire's divisions *Platagènes* and *Otidogènes* in No. 9 of my key, as generally applicable. It may be noted, however, that in the much larger group of *Platagènes* "having the antennal orbits wide and unelevated" there occur exceptions like *Pterohelaeus cornutus* MacL., and *Onosterrhus bos* Cart., in which the orbits are angulate and elevated. But even then the orbits are quite distinct from the narrowly subtriangular process found in the *Amarygminae*.

I have sought in vain for a clear distinction between the *Pedininae* and the *Opatrinae*. Lacordaire, followed by Leconte and Horne, give the dilatation of the front tarsi in the male in the former group as the separating character; but even if constant this seems to me too trivial a division between subfamilies, while an examination of the species of *Cestrinus* and *Mesomorphus* shows this character as evanescent.

I have raised *Briseis* to subfamily rank, a distinction long overdue. An analysis of its distinctive characters may be found in Proc. Linn. Soc. N.S. Wales, 1914, pp. 45, 46. The subfamily *Amphidorinae* has been separated from the *Adeliinae* (from which our genera *Ectyche*, *Micretyche* and *Phaennis* are clearly separated *inter alia* by their subspinose tarsal clothing, as originally indicated by their authors).

Key to Subfamilies.

1. Ventral segments 3 and 4 with hind margins coriaceous 5
 - Ventral segments entirely corneous 2
2. Middle coxae without visible trochantins 3
 - Middle coxae with visible trochantins *Nyctoporinae*.
3. Anterior coxae widely separated *Zopherinae*.
 - Anterior coxae subcontiguous 4
4. Antennae with 11 visible segments *Stenosinae*.
 - Antennae with 10 visible segments
 - (11th segment sunk within the 10th) *Dacoderinae*.
5. Tarsi spinose beneath 6
 - Tarsi bristled or ciliate beneath 8
 - Tarsi pilose or tomentose beneath 9
6. Antennae short *Trachyscelinae*.
 - Antennae moderately long 7
7. Antennal segments gradually widening outwards *Phalerinae*.
 - Apical segments of antennae very slightly thickened *Crypticinae*.
8. Front feebly dilated at sides, body clothed with long erect hairs *Amphidorinae*.
 - Front broadly dilated at sides, body not so clothed *Opatrinae*.
9. Antennal orbits wide and rounded, not (or little) raised 10
 - Antennal orbits short and erect 22
10. Head with ocular groove to receive base of antennae 11
 - Head without such groove 12
11. Head with transverse excavation behind mentum *Bolitophaginae*.
 - Head without such excavation *Ulodinae*.
12. Eyes more prominent than antennal orbits 13
 - Eyes less prominent than antennal orbits 14
13. Mandibles simple *Leiochrinae*.
 - Mandibles bifid at apex *Diaperinae*.
 - Mandibles trifid at apex *Phrenapatinae*.
14. Penultimate segment of tarsi entire 15
 - Penultimate segment of tarsi bilobed *Heterotararinae*.
15. Middle coxae without trochantins 16
 - Middle coxae, with trochantins 17
16. Margins of pronotum and elytra not (or feebly) foliate *Ulominae*.
 - Margins of pronotum and elytra foliate *Cossyphinae*.
17. Mesosternum deeply notched. Metasternum (in general)
 - elongate 18
 - Mesosternum not (or scarcely) notched. Metasternum (in general) short 22
18. Margins of elytra and pronotum foliate *Helaeinae*.
 - Margins of pronotum only foliate *Nyctozeilinae*.
 - Margins of pronotum and elytra not foliate 19
19. Mesosternum declivous, slightly concave or flat *Tenebrioninae*.
 - Mesosternum horizontal, forked or strongly concave 20
20. Mandibles bifid at apex, prosternum (in general) carinate 21

8. Scutellum visible (d) *Caedimorpha*.
 Scutellum not visible 9
9. Elytra tuberculate *Caedius*.
 Elytra without tubercles *Sobas*.
10. Elytra striate-punctate 11
 Elytra irregularly punctate 14
11. Form elongate, subdepressed 12
 Form ovate, very convex 13
12. Nitid, glabrous, size larger (5 mm. or more long) *Heterocheira*.
 Opaque, pilose, size smaller (3 mm. or less) *Hyocis*.
13. Clypeus excised at apex, elytral striae well defined *Scymena*.
 Clypeus truncate, elytral striae sub-obsolete *Diphyrrhynchus*.
14. Pronotum foliate at sides *Edyllus*.
 Pronotum not foliate at sides *Anemia*.
Mesomorphus, *Gonocephalum*, *Cestrinus*, *Achora* and *Adelodemus* occur in-
 land, the remaining genera are sandy beach insects, though *Anemia* and *Hyocis*
 are not exclusively so.

(a) *Endothina* is near and may be congeneric with *Leichenium* Blanch.

(b) *Adelodemus* placed by Gebien as synonymous with *Cestrinus* is more
 nearly allied to *Achora*, though, as I think, distinct.

(c) *Apatelus hopei* Muls. is probably a *Cestrinus*. It has not been identi-
 fied in collections.

(d) The six characters mentioned by the author as distinguishing *Caedio-
 morpha* from *Caedius* are all found in *Caedius sphaeroides* Hope, but the obvious
 scutellum and distinct sculpture in *Caedimorpha* differentiate the genera.

VII. TRACHYSCELINAE. In Australia the only genus is *Trachyscelis*, con-
 taining minute sub-spherical insects to be found plentifully on our beach sand
 hills. They are remarkable in that the number of antennal segments varies with
 the species, *T. ciliaris* Champ. having 10, *laevis* Champ. and *nigra* Cart. having
 11 segments [Vide Proc. Ent. Soc. Lond., 1907, p. xxvi.].

VIII. PHALERIINAE. *Sphargeris physodes* Pasc. A sub-spherical sea-
 beach insect, without seriate sculpture, is our only representative.

IX. CRYPTICINAE. Another monotypic group containing *Crypticus sub-
 maculatus* Champ. found on sea-beaches of north-west Australia.

X. BOLITOPHAGINAE.

1. Antennae clavate 6
 Antennae not clavate 2
2. Strongly convex, elytra tuberculate 3
 Less convex, elytra not tuberculate 4
3. Head of ♂ horned *Byrsax*.
 Head of ♂ without horns *Mychestes*.
4. Elytra sulcate-punctate 5
 Elytra costate (without seriate punctures) *Elascus*.
 ? *Latometus*.
5. Sides of pronotum crenated *Bradymerus*.
 Sides of pronotum entire *Scotoderus*.
6. Antennae with 10 segments *Orcopagia*.
 Antennae with 11 segments 7
7. Form more or less oblong and depressed 8
 Form ovate and convex 10
8. Antennal club of 2 segments *Caanthus*.
 Antennal club of 3 segments 9

9. Elytra with rows of tubercles *Ilyzerus*.
 Elytra striate-punctate *Notocerastes*.
 10. Sides of pronotum explanate (1) *Mnionychus*.
 Sides of pronotum involute *Enhypnon*.

(1) I propose the name *Mnionychus* for *Mnionophilus* Cart., since *Mnionophila* has been twice used previously (Stephens, 1831) and (Boisduval, 1840, Lep.).

XI. ULODINAE.

1. Antennae sub-clavate (apical 2 or 3 clearly wider than preceding) 2
 Antennae lightly widening to apex *Trichulodes*.
 Antennae not widening to apex *Uloides*.
 2. Sides of pronotum excised behind *Ganyme*.
 Sides of pronotum not excised behind *Dipsaconia*.

The tabulation of this group by Pascoe [Ann. & Mag., 1869, p. 31] is misleading. (1) In both *Dipsaconia* and *Ganyme* the 3 apical segments are wider than the rest, though scarcely clavate. (2) The distinction "Prothorax scaly at the sides, *Uloides*," and "Prothorax ciliate, *Dipsaconia*" is fallacious, both having similar or identical scalose clothing.

(3) The character "Antennae art 3 quam 4 duplo longiore" as distinguishing *Ulodica* from *Uloides* is inaccurate, the 3rd segment being only slightly longer than the 4th. It is, I think, too trivial a character for generic distinction, and the name *Ulodica* should disappear as a synonym.

This group is doubtfully separable from the *Boletophaginae*, though Gebien in the Junk Catalogue follows Pascoe in this. Of the two distinguishing characters given by Pascoe, the globose fore-coxae are found in both groups (e.g., *Mychestes*). I have used the other in my key.

XII. DIAPERINAE.

1. Antennae not clavate 2
 Antennae clavate 7
 2. Antennae serrate on inside *Ceropria*.
 Antennae not serrate on inside 3
 3. Antennae strongly widened to apex *Enneboeopsis*.
 Antennae not strongly widened to apex 4
 4. Body oval 5
 Body spherical (facies of *Leiochrinus*) *Derispia*.
 5. Posterior tarsi having segment 1 longer than 2-3 combined 6
 Posterior tarsi having segment 1 not longer than 2-3 combined *Alphitophagus*.
 6. Post-intercoxal process wide and sub-truncate *Spiloscapa*.
 Post-intercoxal process narrow *Platydema*.
 7. Apical 5 segments of antennae forming loose club *Pentaphyllus*.
 Apical 2 segments of antennae clavate *Enneboeus*.

[Note:—*Hoplocephala* (nom. praeocc.) = *Arrhenoplita*. Four Australian insects have been referred by their describers to this genus. *A. exilis* Champ. *pygmaea* Champ. and *erecta* Lea having clavate antennae should be placed under *Pentaphyllus*. *H. callistomonis* Motsch. is unknown in collections and impossible to determine from description. I have not seen a true *Arrhenoplita* from Australia. The genus shares with *Platydema* (at least in some species) the sexual character "males horned," but its species are narrower and more convex than *Platydema*].

XIII. LEOCHRINAE. *Leiochrodes suturalis* Westw. A Coccinella-like insect, is our sole representative. Originally described from Amboina, it has a wide range, being recorded from New Guinea by Gebien. I have found it on the ground under decaying leaves near Sydney, the Tweed River, and near Rockhampton.

XIV. PHRENAPATINAE. A single genus, *Platycilibe*. These are small beetles, found in decaying logs, having tridentate mandibles. I have not been able to see this character in *Brachycilibe*, a genus otherwise allied to *Platycilibe*.

XV. ULOMINAE.

- | | | |
|--|----|-----------------------|
| 1. Antennae clavate | 2 | |
| Antennae not clavate | 7 | |
| 2. Head of ♂ horned | | <i>Gnathocerus</i> . |
| Head of ♂ not horned | 3 | |
| 3. Elytra striate-punctate | 4 | |
| Elytra seriate-punctate | | <i>Microcilibe</i> . |
| Elytra irregularly punctate | 5 | |
| 4. Antennal club with 4 segments | | <i>Tribolium</i> . |
| Antennal club with 2 or 3 segments | | <i>Brachycilibe</i> . |
| Antennal club with 1 segment | | <i>Micruloma</i> . |
| 5. Species with eyes | 6 | |
| Species blind | | <i>Thorictosoma</i> . |
| 6. Form cylindric, antennal club with 4 segments | | <i>Lyphia</i> . |
| Form depressed, antennal club with 3 segments | | <i>Mesotretis</i> . |
| 7. Antennal segments gradually widened to apex | 8 | |
| Antennal segments widening to 8th, thence narrowing | | <i>Latheticus</i> . |
| 8. Tibiae not denticulate on outer edge | 9 | |
| Tibiae denticulate on outer edge | 13 | |
| 9. Head of ♂ horned | | <i>Sitophagus</i> . |
| Head of ♂ not horned | 10 | |
| 10. Elytra striate punctate | 11 | |
| Elytra irregularly punctate | | <i>Hypophloeus</i> . |
| 11. Antennae short, form moderately convex | | <i>Palorus</i> . |
| Antennae long, form depressed | 12 | |
| 12. Antennae little widened to apex | | <i>Ulomoides</i> . |
| Antennae with last 6 segments abruptly widened | | <i>Diaclina</i> . |
| 13. Species with eyes | 14 | |
| Species blind | | <i>Typhluloma</i> . |
| 14. Epipleurae entire, tarsi not villose | | <i>Alphitobius</i> . |
| Epipleurae abbreviated, tarsi villose | | <i>Uloma</i> . |

XVI. COSSYPHINAE. Monotypic (*Cossyphus Odewahni* Pas.).

XVII. HELAEINAE.

- | | |
|---|-----------------------|
| 1. Winged | 2 |
| Without wings | 4 |
| 2. Mesosternum horizontal, forked | <i>Encara</i> . |
| Mesosternum declivous, concave | 3 |
| 3. Tarsi strongly widened (ante penultimate segment bilobed) | <i>Pezohelaeus</i> . |
| Tarsi not thus widened | <i>Pterohelaeus</i> . |
| 4. Head enclosed by prothoracic extension | <i>Helaeus</i> . |
| Head not thus enclosed | 5 |
| 5. Form depressed, mesosternum not or feebly notched at apex | <i>Sympetes</i> . |
| Form convex, mesosternum clearly notched at apex | <i>Saragus</i> . |

XVIII. NYCTOZOILINAE.

1. Eyes divided *Dysarchus*.
Eyes not divided 2
 2. Anterior tibiae with outer margins dentate 3
Anterior and intermediate tibiae with outer margins dentate. *Trichosaragus*.
 3. Mandibles bifid at apex 4
Mandibles simple 9
 4. Submentum with strong vertically projecting lateral tooth 5
Submentum angulate, scarcely or very shortly dentate . . . 6
Submentum edentate 8
 5. Form ovate and very convex *Onosterrhus*.
Form more elongate and depressed *Agasthenes*.
 6. Elytra smooth (or nearly so) *Amphianax*.
Elytra rugose-reticulate or costate 7
Elytra sulcate-punctate *Ononyctus*.
 7. Form ovate and explanate *Nyctozoilus*.
Form oblong-ovate, scarcely explanate *Aethalides*.
 8. Pronotum nearly as long as wide, sides crenulate *Styrus*.
Pronotum much wider than long, sides entire *Byallius*.
 9. Body glabrous, margins of tibiae entire * *Onoglypta*.
Body pilose, anterior tibiae crenulate on margin *Onotrichus*.
- * *Onoglypta*. I propose this name for *Aglypta* Geb. since *Aglyptus* has been twice used previously. (1) Först. (Hymenoptera) 1856. (2) Le Conte (Coleoptera) 1866.

The genera *Onosterrhus*, *Agasthenes* and *Amphianax* are very difficult to separate by any one constant character, the species having concurrent forms. *Aethalides* and *Nyctozoilus* also tend to run into one another, the genotype of the former *Ae. punctipennis* Bates has parallel elytra, while the elytra of *marginicollis* and *decemcostata* Cart. are nearly so, whereas *Ae. Stepheni* and *Ae. Cori* might be placed justifiably in *Nyctozoilus*.

XIX. TENEBRIONINAE.

1. Epipleurae entire, mandibles bifid, apterous 2
Epipleurae abbreviated, mandibles bifid or simple, mostly
winged 6
2. Tarsi silky pubescent *Hypaulax*.
Tarsi sparsely pilose *Paratoxicum*.
Tarsi coarsely pubescent 3
3. Form ovate (very nitid) *Asphalus*.
Form oblong 4
4. Elytra strongly costate *Sloanea*.
Elytra striate punctate 5
5. Tibiae strongly spurred at apex *Meneristes*.
Tibiae feebly spurred at apex *Tenebrio*.
6. Antennae non-clavate, head without horns in ♂ 7
Antennae clavate, head horned in ♂ *Toxicum*.
7. Mandibles bifid at apex 8
Mandibles simple 10
8. Tibiae without apical spurs 9
Tibiae with short apical spurs *Teremenes*.
9. Form wide and depressed, apterous *Hydissus*.
Form narrow and subcylindric, winged *Oectosis*.
10. Lateral border of pronotum more or less explanate 11
Lateral border of pronotum not explanate 12

11. Fore and post-tibiae dentate in ♂ (in *S. sulcigera*) *Setenis*.
 Fore and post-tibiae undentate in ♂ *Promethis*.
 12. Elytra seriate-punctate (punctate-striate) *Encyalesthus*.
 Elytra striate-punctate *Menephilus*.
Synercticus and *Tanylypa* have open fore coxal cavities, and thus logically fall under *Pythidae*, but, for the present, I prefer to consider them as aberrant members of the TENEBRIONINAE, distinguished thus:—

Elytra irregularly punctate between subobsolete costae *Synercticus*.
 Elytra striate-punctate *Tanylypa*.

XX. BRISEINAE. The single genus *Briseis*. For distinctions from TENEBRIONINAE and CYPHALEINAE see Proc. Linn. Soc. N.S. Wales, 1914, pp. 45, 46

XXI. HETEROTARSINAE. Monotypic (*Notoprataeus litoralis* Cart.).

XXII. CYPHALEINAE.

- | | |
|--|--------------------------|
| 1. Prosternum prolonged and carinate | 2 |
| Prosternum not prolonged nor carinate | 23 |
| 2. Antennae rather short, segments 7-10 thicker and shorter than preceding | 3 |
| Antennae long, segments 7-10 little enlarged | 17 |
| 3. Tibiae dilated at apex | <i>Lepispilus</i> . |
| Tibiae not dilated at apex | 4 |
| 4. Body glabrous | 5 |
| Body pilose | 15 |
| 5. Elytra striate-punctate | <i>Platyphanes</i> . |
| Elytra seriate-punctate | <i>Opigenia</i> . |
| Elytra irregularly punctate | 6 |
| 6. Form oblong or oblong-ovate | 7 |
| Form widely ovate or subspherical | 13 |
| 7. Anterior angles of pronotum blunt and little produced | 8 |
| Anterior angles of pronotum acute and produced | 10 |
| 8. Sides of pronotum not foliate | 9 |
| Sides of pronotum foliate | <i>Campanotiphilus</i> . |
| 9. Elytral punctures dense and irregular | <i>Timeneca</i> . |
| Elytral punctures sparse and subseriate | <i>Mitrothorax</i> . |
| 10. Elytra sub-gibbous; eyes rather close | <i>Eutoreuma</i> . |
| Elytra not at all gibbous, eyes widely separate | 11 |
| 11. Form convex, elytra densely punctate | <i>Trisilus</i> . |
| Form depressed, elytra sparsely punctate | 12 |
| 12. Epipleurae entire | (1) <i>Aphectus</i> . |
| Epipleurae abruptly narrowed behind | <i>Olisthaena</i> . |
| 13. Sides of pronotum not foliate | 14 |
| Sides of pronotum foliate | <i>Hemicyclus</i> . |
| 14. Sides of elytra foliate, disc sub-costate | <i>Ospidus</i> . |
| Sides of elytra not foliate, disc non-costate | <i>Bolbophanes</i> . |
| 15. Elytra striate-punctate, body oblong | <i>Laonicus</i> . |
| Elytra irregularly punctate, body oval | 16 |
| 16. Elytra closely punctate with sub-costate impressions | <i>Amarygmimus</i> . |
| Elytra sparsely punctate without such impressions | <i>Altes</i> . |
| 17. Anterior angles of prothorax advanced and spinose | 18 |
| Anterior angles of prothorax advanced but not spinose | 19 |
| 18. Elytra ovate and (in general) strongly convex | <i>Prophanes</i> . |
| Elytra subparallel and depressed | <i>Anausis</i> . |

19. Basal segments of post-tarsi nearly as long as the rest united . *Chartopteryx*.
 Basal segments of post-tarsi much shorter than the rest united. 20
20. Epipleurae gradually narrowed behind *Cyphaleus*.
 Epipleurae abruptly narrowed behind 21
21. Elytra seriate-punctate, form parallel *Paraphanes*.
 Elytra irregularly punctate 22
22. Elytra spinose at apex, form elliptic *Oremasis*.
 Elytra not spinose at apex, form widely ovate *Cyclophanes*.
 24
23. Mesosternum notched at apex *Mithippia*.
 Mesosternum not notched at apex
24. Tarsi closely and finely pilose *Lygestira*.
 Tarsi with stiff hairs at apices of segments only *Barytipha*.
 (1) *Aphectus*. I propose this name for the preoccupied name *Hectus* Pasc.
 used by Fabricius in 1775 (Sys. Ent.).

XXIII. CNODALONINAE.

1. Body winged 2
 Body apterous *Apterotheca*.
2. Form sub-cylindric 3
 Pronotum explanate, elytra ovate 4
3. Elytra coarsely, irregularly punctate *Titaena*.
 Elytra finely striate-punctate *Thesilea*.
4. Mesosternum horizontal (a) *Chariotheca*.
 Mesosternum declivous *Espites*.

N.B.—The last two genera doubtfully distinct.

(a) *Chariotheca* Pasc. holds good. My substitution of *Chariothes* was unnecessary since *Chariotheca* Dej is a *nomen nudum*.

XXIV. ADELIINAE.

1. Humeri dentiform 2
 Humeri not dentiform 3
2. Terminal segment of antennae as long as the preceding 3 . . *Macroperas*.
 Terminal segment of antennae not so long *Daedrosia*.
3. Sides of pronotum foliate 4
 Sides of pronotum not, or scarcely, foliate 8
4. Elytra not closely adapted to prothorax 5
 Elytra closely adapted to prothorax 7
5. Tarsi tomentose beneath 6
 Tarsi pilose beneath *Dystalica*.
6. Front with stirrup-like impression, 3rd antennal segment not
 much longer than 4th *Cardiothorax*.
 Front without such impression, 3rd antennal segment much
 longer than 4th *Adelium*.
7. Epipleurae subvertical *Coripera*.
 Epipleurae acutely connected with elytra *Seirotana*.
8. Mandibles notched at apex 9
 Mandibles simple *Eutherama*.
9. Head and sides of pronotum spinose or subangulate *Beplegenes*.
 Head and sides of pronotum not so 10
10. Base of pronotum not coarctate *Otrintus*.
 Base of pronotum coarctate 11

11. Apex of pronotum emarginate *Nototrinitus*.
Apex of pronotum not (or scarcely) emarginate 12
12. Eyes nearly round *Brycopia*.
Eyes narrow, transverse 13
13. Antennae moniliform, terminal segment large *Leptogastrus*.
Antennae not moniliform, terminal segment moderate 14
14. Tarsi tomentose beneath *Apasis*.
Tarsi pilose beneath *Licinoma*.

XXV. HELOPINAE.

1. Pronotum strongly emarginate 2
Pronotum feebly emarginate * *Metisopus*.
Pronotum not at all emarginate 3
2. Elytra oblong, subparallel *Tarpela*.
Elytra obovate *Austropeus*.
3. Prosternum more or less compressed *Omolipus*.
Prosternum not compressed *Campolene*.

*The monotypic *Metisopus purpuricipennis* Bates is found in Norfolk Island.

XXVI. MERACANTHINAE.

Two genera each with a single rare species, of widely different facies are known from tropical Queensland. To these I have added *Melytra* from Tasmania, placed inappropriately, I think, by Gebien under the *Cnodaloninae* and by its author under *Apocryphinae*. It must be excluded from the latter by the presence of trochantins on the intermediate coxae. The long, slender antennae, sides of front obliquely (though slightly) elevated, hind coxae widely separated, the convex, oval and apterous body are all consistent with the position assigned to it here.

The three genera are readily separable as follows:—

- Elytra strongly and closely pustulose *Bluops*.
Elytra coarsely sulcate-punctate: size large *Arynaon*.
Elytra seriate punctate: size small *Melytra*.

XXVII. AMARYGMINAE.

1. Glabrous 2
Pilose *Trichamarygmus*.
2. Mandibles bifid at apex *Amarygmus*.
Mandibles simple *Chalcopterus*.

XXVIII. STRONGYLINAE.

1. Form subcylindric and elongate *Strongylium*.
Form oblong and shorter 2
2. Pronotum nitid, sides straight and entire 3
Pronotum opaque, sides dentate in middle *Notostongylium*.
3. Shoulders with elevated callosities *Pseudostongylium*.
Shoulders without callosities *Ebenolus*.

This subfamily is, as Pascoe stated (Ann. and Mag., 1869) "merely a designation for a number of discrepant forms" with "no more definite generic idea than in any one of the so-called genera of the Linnean epoch." Thirteen Australian species have been recorded, chiefly from tropical regions. I am unable to find clearly defined limits to the genus *Strongylium* in Mäklin's voluminous monograph.

Their fragile structure, long, thin, antennae and legs give them a strong likeness to *CISTELIDAE*, with which they are often confused in collections.

Order COLEOPTERA.

Family TENEBRIONIDAE.

Subfamily ZOPHERINAE.

ZOPHEROSIS. White, Zool. Soc. Lond., 1859, p. 121.

1. *georgei* White, l.c., p. 121 (pl. xvi., f. 1) N.S.W.

Subfamily STENOSINAE.

COTULADES. Pasc., Jour. Ent., 1860, p. 119.

2. *fascicularis* Pasc., l.c., p. 119 Q. to Tas.
 3. *leucospila* Hope, Ent. Soc. Lond., 1845, p. 107 N.A.
 4. *montanus* Blackb., Roy. Soc. S.A., 1893, p. 132 . . . Blue Mts., N.S.W.
 5. *tuberculatus* Cart., Linn. Soc. N.S.W., 1921, p. 308 . . Mittagong, N.S.W.

DOCALIS. Pasc., Jour. Ent., 1860, p. 121.

6. *funerosus* Hope, Ent. Soc. Lond., 1845, p. 107 . . . N.S.W., V., T.
degener Pasc., Jour. Ent., 1860, p. 121.
exoletus Pasc., l.c., p. 122.
maculatus Blackb., Roy. Soc. S.A., 1893, p. 132.

Subfamily DACODERINAE.

TRETOTHORAX. Lea, Roy. Soc. V., 1911, p. 211.

7. *cleistostoma* Lea, l.c., p. 213 (pl. xvi., f. 2) Q.

Subfamily NYCTOPERINAE.

EXANGELTUS. Blackb., Roy. Soc. S.A., 1897, p. 93.

8. *angustus* Blackb., l.c., p. 94 (pl. xvi., f. 3) W.A.
 9. *gracilior* Blackb., l.c., 1903, p. 308 S.A.
 10. *rustipennis* Cart., Linn. Soc. N.S.W., 1919, p. 140 Q.
EDYLIUS. Champ., Ent. Soc. Lond., 1894, p. 353.

11. *canescens* Champ., l.c., p. 354 T.

DIPHYRRHYNCUS. Fairm., Rev. Zool., 1849, p. 445.*Acanthosternus* Montr., Soc. Ent. Fr., 1860, p. 289.

12. *apicalis* Champ., Ent. Soc. Lond., 1894, p. 368 W.A.
 13. *ellipticus* Champ., l.c., p. 367 N.W.A.

HETEROCHEIRA. Lacord, Gen. Col. V., 1859, p. 335.

14. *australis* Boisd., Voy. Astrol., 1835, p. 258 W.A.
 15. *tropica* Cart., Linn. Soc. N.S.W., 1924, p. 33 Townsville, Q.

Subfamily OPATRINAE.

SCYMENA. Pasc., Jour. Ent., 1866, p. 455.

16. *amphibia* Pasc., Ann. Mag. Nat. Hist., 1870, p. 94 S.A.; W.A.
australis Blackb., Roy. Soc. S. Aus., 1887, p. 270.
 17. *variabilis* Pasc., Jour. Ent., 1866, p. 455 N.S.W.

MESOMORPHUS. Seidl., Nat. Ins. Deutsch., 1893, p. 361.*Hopatomorpha* Blackb., Roy. Soc. S. Aus., 1907, p. 289.

18. *darlingensis* Blackb., Roy. Soc. S. Aus., 1894, p. 216 N.S.W.
 19. *darwinii* Blackb., l.c., p. 217 N.A.
 20. *leai* Cart., l.c., 1914, p. 221 Hughenden, Q.
 21. *longicornis* Blackb., l.c., 1892, p. 40 A.
 22. *ragabundus* Champ., Ent. Soc. Lond., 1894, p. 361 N.W.A.

23. *villiger* Blanch., Voy. Pole Sud., 1853, p. 154 W.A. (Asia, Afr.)
asperulus Fairm., Soc. Ent. Belg., 1898, p. 234.
dermestoides Reitt., Best Tab., 1904, p. 74.
dispersus Champ., Ent. Soc. Lond., 1894, p. 361.
mustelinus Fairm., Note Leyd. Mus., 1882, p. 221.
puberulus Fauv., Bull. Soc. Linn. Normand., 1867, p. 187, nota.
- CESTRINUS*. Er., Arch. f. Naturg., 1842, p. 172.
Isopteron Hope, Col. Man., 1840, p. 112.
24. *brevis* Champ., Ent. Soc. Lond., 1894, p. 356 N.S.W. to W.A.
aspersus Blackb., Roy. Soc. S. Aus., 1894, p. 210.
puellus Geb., Faun. Sud-west. Aus., 1908, p. 325.
25. *championi* Blackb., Roy. Soc. S. Aus., 1894, p. 210 . . . N.S.W. to W.A.
eremicola Blackb., l.c., p. 211.
zietzi Blackb., l.c., p. 212.
26. *costatus* Geb., Fauna Sud-west Aus., 1908, p. 326 W.A.
27. *dentatus* Cart., Linn. Soc. N.S.W., 1921, p. 309 Camooweal, Q.
28. *punctatissimus* Pasc., Ann. Mag. Nat. Hist., 1869, p. 278 . . N.S.W. to T.
aversus Pasc., l.c., p. 278.
posticus Pasc., l.c., p. 278.
minor Blackb., Roy. Soc. S. Aus., 1894, p. 212.
29. *trivialis* Er., Arch. Naturg., 1842, p. 173 Q. to T.
opatroides (*Isopteron*) Hope, Ent. Soc. Lond., 1842, p. 77.
piceitarsis Hope, l.c., p. 76.
squamosus (*Apatelus*) Mael., Ent. Soc. N.S.W., 1872, p. 278.
angustior Blackb., Roy. Soc. S. Aus., 1894, p. 211.
- APATELUS*. Muls. et Rey., Mem. Acad. Lyon, 1859, p. 153.
- *30. *hopei* Muls., l.c., p. 154 A.
- ACHORA*. Pasc., Ann. Mag. Nat. Hist., 1869, p. 279.
Prionotus Muls. et Rey. Mém. Acad. Lyon, 1859, p. 150.
Priothorax Geb., Cat. Junk., 1910, p. 318.
31. *serricollis* Hope, Ent. Soc. Lond., 1842, p. 77 Tas.
denticollis Blanch., Voy. Pole Sud., 1853, p. 154.
obscurus Er., Wieg. Arch., 1842, p. 173.
32. *tuberculatus* (*cestrinus*) Cart., Roy. Soc. S. Aus., 1914, p. 369 . . W.A.
- ADELODEMUS*. Haag., Jour. Mus. Godeffr., 1878, p. 120.
Apostethus Pasc., Ann. Mag. Nat. Hist., 1882, p. 27.
33. *excisicollis* Cart., Linn. Soc. N.S.W., 1908, p. 403 (pl. xvi., f. 4) . . Q.
34. *squalidus* Mael., Ent. Soc. N.S.W., 1872, p. 278 Q.
asperulus Haag., Jour. Mus. Godeffr., 1878, p. 121.
foliata (*seirotrana*) Cart., R.S.S. Aus., 1914, p. 403.
- *35. *terrenus* Pasc. (*Apostethus*) Ann. Mag. Nat. Hist., 1882, p. 28 . . . Q.
- ANEMIA*. Cast., Hist. Nat., 1840, p. 218.
36. *caulobioides* Cart., Linn. Soc. N.S.W., 1920, p. 224 W.A.
- GONOCEPHALUM*. Chevr., Dict. Univ. d'Hist. Nat., 1849, p. 274.
Hopatrum Blackb., Roy. Soc. S. Aus., 1907, p. 286.
37. *adelaidae* Blackb., Roy. Soc. S. Aus., 1894, p. 214 S.A.
38. *alternatum* Cart., Linn. Soc. N.S.W., 1915, p. 532 Raine Is., Q.
- *39. *australe* Boisd., Voy. Astrol., 1835, p. 251 A.
40. *carpentariae* Blackb., Roy. Soc. S. Aus., 1894, p. 213 N.A.
41. *costipenne* Cart., Linn. Soc. N.S.W., 1915, p. 533 Cairns, Q.
costatum Cart. Roy. Soc. S. Aus., 1914, p. 222.

42. *cowardense* Blackb., Roy. Soc. S. Aus., 1894, p. 215 S.A.
 43. *elderi* Blackb., l.c., 1892, p. 39 W.A.
 44. *macleayi* Blackb., l.c., 1907, p. 288 S.Q.
 45. *mastersi* MacL., Ent. Soc. N.S.W., 1872, p. 277 Q., N.S.W.
 46. *meyricki* Blackb., Roy. Soc. S. Aus., 1894, p. 213 V. and W.A.
 victoriae Blackb., l.c., p. 218.
 47. *misellum* Blackb., l.c., 1907, p. 288 S.A.
 48. *subcostatum* Cart., Linn. Soc. N.S.W., 1921, p. 309 . . . Stanthorpe, Q.
 49. *torridum* Champ., Ent. Soc. Lond., 1894, p. 359 N.W.A.
 50. *walkeri* Champ., l.c., p. 360 N.W.A.
ENDOTHINA. Carter, Linn. Soc. N.S.W., 1924, p. 536.
 51. *squamosa* Cart., l.c., p. 537 Sydney, N.S.W.
HYOCIS. Pasc., Jour. Ent., 1866, p. 457.
 52. *bakewelli* Pasc., l.c., p. 457 Vic. to W.A.
 cancellata Lea, Roy. Soc. Vic., 1907, p. 164.
 (var) *occidentalis* Blackb., Linn. Soc. N.S.W., 1895, p. 102, W.A.
 53. *bicolor* Cart., Linn. Soc. N.S.W., 1908, p. 402 N.S.W., T.
 54. *inquitina* Cart., l.c., 1921, p. 310 Perth, W.A.
 55. *minor* Cart., l.c., 1920, p. 225 Stradbroke Is., Q.
 56. *nigra* Blackb., l.c., 1895, p. 101 S.A.
 57. *pallida* MacL., Ent. Soc. N.S.W., 1872, p. 278 Q., N.S.W.
 58. *pubescens* MacL., l.c., p. 279 Q., N.S.W.
 59. *subparallela* Champ., Ent. Soc. Lond., 1894, p. 363 . . N.S.W. to W.A.
 variegata Blackb., Linn. Soc. N.S.W., 1895, p. 102.
CAEDIUS. Blanch., Hist. Nat. Ins., 1845, p. 13.
 60. *lindi* Blackb., Roy. Soc. S. Aus., 1887, p. 271 S.A.
 61. *sphaeroides* Hope, Ent. Soc. Lond., 1842, p. 77 S.A. & Q.
 tuberculatus Cart., Roy. Soc. S. Aus., 1914, p. 370.
SOBAS. Pasc., Jour. Ent., 1863, p. 45.
 Trigonotarsus Hope, Ent. Soc. Lond., 1845, p. 106.
 Pseudocaedius Blackb., Roy. Soc. S.A., 1890, p. 91.
 62. *australis* Hope, l.c., p. 76 Port Essington, N.W.A.
 squamosus (*Pseudocaedius*) Blackb., l.c.
CAEDIOMORPHA. Blackb., Roy. Soc. S. Aus., 1888, p. 272.
 63. *heteromera* (*Pedilophorus*) King, Ent. Soc. N.S.W., 1869, p. 44 (pl.
 xvi., f. 6) All States.
 australis Blackb., Roy. Soc. S. Aus., 1888, p. 272.
 Subfamily TRACHYSCELINAE.
TRACHYSCELIS. Latr., Gen. Crust. et Ins., 1809, p. 379.
 64. *ciliaris* Champ., Ent. Mon. Mag., 1893, p. 254 W.A.
 65. *laevis* Champ., l.c., p. 254 W.A.
 66. *nigra* Cart., Linn. Soc. N.S.W., 1906, p. 251 N.S.W., Q.
 Subfamily PHALERIINAE.
SPHARGERIS. Pasc., Jour. Ent., 1860, p. 122.
 67. *physodes* Pasc., l.c., p. 122 V., S.A.
 Subfamily CRYPTICINAE.
CRYPTICUS. Latr., Règne Anim., 1817, p. 298.
 68. *submaculatus* Champ., Ent. Soc. Lond., 1894, p. 362 N.W.A.
 Subfamily BOLITOPHAGINAE.
BRADYMERUS. Perroud., Soc. Linn. Lyon., 1864, p. 540.
 Isostira Pasc., Ann. Mag. Nat. Hist., 1870, p. 97.

69. *crenatus* Pasc., l.c., p. 98 Q
granaticollis Fairm., Ann. Soc. Ent. Belg., 1883, p. 23.
70. *raucipennis* Blackb., Roy. Soc. S. Aus., 1892, p. 225 Q.
seriatus Geb., Exp. Neerl. N. Guinea, 1920, p. 243
- SCOTODERUS. Perroud., Ann. Soc. Linn. Lyon., 1864, p. 114.
Dechius Pasc., Jour. Ent., 1866, p. 455.
71. *cancellatus* Montr., Soc. Ent. Fr., 1860, p. 296.
aphodioides Pasc., Jour. Ent., 1866, p. 455 . . N.S.W., Q., New
Caledon.
- *72. *costatus* Fairm., Rev. Zool., 1849, p. 421 Wallis Is.
73. *scissicollis* Bates, Ent. Soc. Lond., 1868, p. 266 N.S.W.
- BYRSAX. Pasc., Jour. Ent., 1860, p. 42.
74. *cozi* Cart., Roy. Soc. S. Aus., 1914, p. 371 N.S.W.
75. *egenus* Pasc., Jour. Ent., 1866, p. 459 N.S.W., Q.
76. *macleayi* Pasc., l.c., p. 459 N.S.W., Q.
77. *pinnaticollis* Cart., Roy. Soc. S. Aus., 1914, p. 234 Q.
78. *saccharatus* Pasc., Ann. Mag. Nat. Hist., 1870, p. 95 Q.
- NOTOCERASTES. Cart.
79. *blackburni* Cart. N.S.W., V.
- ILYXERUS. Pasc., Jour. Ent., 1866, p. 458.
- *80. *asper* Pasc., l.c., p. 458 N.S.W.
- CAANTHUS. Champ., Ent. Soc. Lond., 1894, p. 378.
81. *gibbicollis* Champ., l.c., p. 378 T.
- ORCOPAGIA. Pasc., Ent. Soc. Lond., 1868, p. 12.
82. *monstrosa* Pasc., l.c., p. 12 N.S.W., V.
83. *regularis* Cart., Roy. Soc. S. Aus., 1914, p. 223 Q.
- MYCHESTES. Pasc., Ann. Mag. Nat. Hist., 1870, p. 96.
84. *congestus* Pasc., l.c., 1883, p. 436 Q., N.S.W.
85. *lignarius* Pasc., l.c., 1870, p. 97 Q., N.S.W.
86. *mastersi* Mael., Ent. Soc. N.S.W., 1872, p. 279 Q.
87. *pascoei* Mael., l.c., p. 279 (pl. xvi., f. 7) Q.
- MNIONYCHUS. Cart.
- Mnionophilus* Cart., Linn. Soc. N.S.W., 1919, p. 141.
88. *costatus* Cart., l.c., p. 143 Waratah, T.
89. *horridus* Cart., l.c., p. 142 Cradle Mt., T.
- ENHYPNON. Cart., Linn. Soc. N.S.W., 1919, p. 143.
90. *laticeps* Cart., l.c., p. 144 T.
- ELASCUS. Pasc., Jour. Ent., 1860, p. 119.
91. *crassicornis* Pasc., l.c., p. 120 V.
92. *lunatus* Pasc., l.c., p. 120 V., T.
93. *major* Cart., Linn. Soc. N.S.W., 1921, p. 310 Dorrigo, N.S.W.
- LATOMETUS. Er., Arch. Naturg., 1842, p. 213.
- *94. *pubescens* Er., l.c., p. 213 T.
(Described from a single example and apparently not since identified.
Possibly *Colydiidae*).

Subfamily AMPHIDORINAE.

- ECTYCHE. Pasc., Ann. Mag. Nat. Hist., 1869, p. 143.
95. *bicolor* Cart., Linn. Soc. N.S.W., 1918, p. 709 King R., N.A.
96. *coerulea* Champ., Ent. Soc. Lond., 1894, p. 397 N.W.A.
97. *erebea* Pasc., Ann. Mag. Nat. Hist., 1869, p. 144 W.A.
98. *nana* Pasc., l.c., p. 145 S.A.
99. *scabripennis* Bates, Ent. Soc. Lond., 1873, p. 360 W.A.

100. *sculpturata* Bates, l.c., p. 361 (pl. xvi, f. 5) W.A.
 101. *semibullata* Cart., Linn. Soc. N.S.W., 1920, p. 248 Geraldton, W.A.
 102. *tuberculipennis* Bates, Ent. Soc. Lond., 1873, p. 361 W.A.
MICRETYCHE. Bates, Ent. Soc. Lond., 1873, p. 362.
 103. *ferruginea* Bates, l.c., p. 364 W.A.
 var. dubia Bates, l.c.
 ryei Bates, l.c., p. 364.
 104. *intermedia* Bates, l.c., p. 363 Champion Bay, W.A.
PHAENNIS. Champ., Ent. Soc. Lond., 1894, p. 399.
 105. *fasciculata* Champ., l.c., p. 400 Blue Mts., N.S.W., T.
 Subfamily ULODINAE.
DIPSACONIA. Pasc., Jour. Ent., 1860, p. 123.
 106. *australis* Hope, Ent. Soc. Lond., 1845, p. 108 S.A., V., T.
 bakewelli Pasc., Jour. Ent., 1860, p. 124.
 107. *pyritosa* Pasc., l.c., p. 124 Q., N.S.W., V.
ULODES. Er., Arch. Naturg., 1842, p. 180.
 Ulodica Pasc., Ann. Mag. Nat. Hist., 1869, p. 31.
 108. *hispidus* Pasc., l.c., p. 32 N.S.W.
 109. *verrucosus* Er., Arch. Naturg., 1842, p. 181 V., T.
 varicornis Hope, Ent. Soc. Lond., 1842, p. 78.
TRICHULODES. Cart., Roy. Soc. S.A., 1914, p. 223.
 110. *punctatus* Cart., l.c., p. 224 Q.
GANYME. Pasc., Ann. Mag. Nat. Hist., 1869, p. 32.
 111. *sapphira* Newm., The Entom., 1842, p. 404 (pl. xvi, f. 8) N.S.W., V., T.
 howitti Pasc., Ann. Mag. Nat. Hist., 1869, p. 33.
 Subfamily DIAPERINAE.
SPILOSCAPHA. Bates, Ent. Mo. Mag., 1873, p. 202.
 112. *thalloides* Pasc., Ann. Mag. Nat. Hist., 1869, p. 281 N.S.W.
 crassicornis Bates, Ent. Mo. Mag., 1873, p. 203.
PLATYDEMA. Cast et Brll. Ann. Sc. Nat., 1831, p. 350.
 Neomida Motsch., Bull. Mon., 1873, p. 476.
 Histeropsis Chevr., Pet. Nour. Ent., 1878, p. 221.
 Typhobia Pasc., Ann. Mag. Nat. Hist., 1869, p. 279.
 113. *abdominale* Geb., Fn. Sudw. Aus., 1908, p. 327 W.A.
 114. *aries* Pasc., Ann. Mag. Nat. Hist., 1869, p. 280 N.S.W., Q.
 115. *bicinctum* Champ., Ent. Soc. Lond., 1894, p. 373 N.W.A.
 116. *deplanatum* Champ., l.c., p. 374 N.W.A.
 117. *fuligineum* Pasc. (*Typhobia*) Pasc., Ann. Mag. Nat. Hist., 1869, p.
 279 V., N.S.W., Q.
 118. *laticolle* Macl., Ent. Soc. N.S.W., 1872, p. 280 Q.
 119. *limacella* Pasc., Ann. Mag. Nat. Hist., 1869, p. 280 S.A., V., N.S.W., Q.
 fossulatum Blackb., Roy. Soc. S. Aus., 1887, p. 273.
 120. *limbatum* Cart., Linn. Soc. N.S.W., 1921, p. 311 Murray R., S.A.
 121. *macleayi* Cart. Kuranda, Q.
 122. *metallicum* Cart., l.c., 1908, p. 404 N.S.W., Q.
 123. *pascoei* Macl., Ent. Soc. N.S.W., 1872, p. 280 Q., N.S.W., Vic.
 victoriense Blackb., Roy. Soc. S.A., 1893, p. 297.
 124. *rufibase* Cart., Linn. Soc. N.S.W., 1918, p. 701 N.Q.
 125. *striatum* Montr., Soc. Ent. Fr., 1860, p. 290, N.S.W., Q., Lord Howe Is.,
 New Caledonia.
 kanalense Perroud., Soc. Linn. Lyon., 1864, p. 113.

- oritica* Pasc., Ann. Mag. Nat. Hist., 1869, p. 280.
spicatum Oll., Ins. Fauna, L. Howe Is., 1889, p. 87.
championi Blackb., Roy. Soc. S.A., 1890, p. 139.
obscurum Blackb., Linn. Soc. N.S.W., 1888, p. 1387.
 126. *sulcatopunctatum* Cart., Linn. Soc. N.S.W., 1922, p. 73 N.Q.
 127. *tetraspilotum* Hope, Ent. Soc. Lond., 1842, p. 78 . . Q., N.S.W., V., S.A., T.
 tasmanum Mars., Soc. Ent. Fr., 1876, p. 110.
ALPHITOPHAGUS. Steph., Ill. Brit. Ent., 1832, p. 12.
 Phyletes Redt., Gatt. deutsch. Käf. Fn., 1845, p. 128.
 Phylethus Redt., Fn. Austr., 1849, p. 589.
 128. *bifasciatus* Say., Jour. Acad. Phil., 1823, p. 268 Cosmop.
 pictus Ménét., Cat. rais., 1832, p. 203.
 populi Redt., Fn. Austr., 1849, p. 589.
 quadripustulatus Steph., Ill. Brit. Ent., 1832, p. 12.
 *129. *quadrinotatus* Mars., Soc. Ent. Fr., 1876, p. 110 A.
 [Unidentified in Australian colls.; probably 127 supra.]
CEROPRIA. Cast et Brll. Ann. Sc. Nat., 1831, p. 396.
 Epilampus Blanch., Hist. Nat. Ins., 1845, p. 30.
 130. *maculata* Geb., Cat. Junk, 1911, p. 383 (pl. xvi, fig. 9) N.Q.
 bifasciata Cart., Linn. Soc. N.S.W., 1908, p. 404 (nom. praeoc.)
 quadriplagiata Geb., Exp. Neerl. N. Guinea, 1920, p. 255.
 131. *peregrina* Pasc., Jour. Ent., 1866, p. 460 N.S.W., Q.
 janthinipennis Chevr., Pet. Nouv., Ent., 1877, p. 170.
 *131a. (?) *novica* (*Platydemia*) Motsch., Bull. Mosc., 1873, p. 470. .
 spectabilis Cast et Brll. Mon., p. 397 (?) A.
 [Doubtfully Australian. The note in description says "Cette espèce vient d'Amerique; M. Dupont l'a recue aussi de la Nouvelle Hollande." If the latter statement be true, it may be the same as *Espites basalis* Pasc.—H.J.C.].
 132. *valga* Pasc., Ann. Mag. Nat. Hist., 1869, p. 281 N.S.W., Q.
ENNEBOEUS. Waterh., Ent. Soc. Lond., 1878, p. 228.
 133. *australis* Champ., l.e., 1894, p. 375 T.
 *134. *ovalis* Waterh., l.e., 1878, p. 229 T.
ENNEBOEOPSIS. Champ., Ent. Soc. Lond., 1894, p. 375.
 135. *pruinus* Champ., l.e., p. 376 T.
PENTAPHYLLUS. Latr., Règne anim., 1829, p. 30.
 136. *erecta* (*Arrhenoplita*) Lea, Linn. Soc. N.S.W., 1898, p. 581 . . N.S.W.
 137. *exilis* (*Arrhenoplita*) Champ., Ent. Soc. Lond., 1894, p. 372 . . N.W.A.
 138. *pygmaea* (*Arrhenoplita*) Champ., l.e., p. 371 N.W.A.
 *139. *Hoplocephala callistomomis* Motsch., Bull. Mosc., 1873, p. 469, has not been identified. Its generic status is doubtful.
DERISPIA. Lewis, Ann. Mag. Nat. Hist., 1894, p. 389.
 140. *coccinelloides* Westw., Tijds. Schr. v. Ent., 1883, p. 69 . . . Q., Malay Is.
 Subfamily LEIOCHRINAE.
LEIOCHRODES. Westw., Tijds. Schr. v. Ent., 1883, p. 69.
 Leiochrota Westw., l.e., p. 70.
 Ades Guér., Arch. Ent., 1857, p. 277.
 Hades Thoms., Mus. Sc., 1860, p. 13.
 Pimplema Pasc., Ann. Mag. Nat. Hist., 1887, p. 16.
 141. *suturalis* Westw., l.e., p. 73 N.S.W., Q., Amboina.
 (Coccinellid-like insect found under leaves in moist places.)

Subfamily PHRENAPATINAE.

PLATYCILIBE. Cart., Linn. Soc. N.S.W., 1911, p. 205.

142. *brevis* Cart., l.c., p. 205 (pl. xvi., f. 10) Mt. Wilson and Mt. Royal,
N.S.W., V.

143. *bicolor* Cart., Roy. Soc. S. Aus., 1914, p. 225 . . . Tambourine Mt., Q.

144. *integrifrons* Cart., Linn. Soc. N.S.W., 1920, p. 226 . . . N.S.W., Q.

145. *triclavata* Cart., l.c., 1921, p. 311 . . . Tambourine Mt., Q.

Subfamily ULOMINAE.

GNATHOCERUS. Thunb., Vetensk. Acad. Handl., 1814, p. 47.

146. *cornutus* F., Ent. Sys. Suppl., 1798, p. 51 . . . Cosmopolitan.

cucullatus Montr., Soc. Ent. Fr., 1860, p. 294.

laeviusculus Steph., Ill. Brit., 1832, p. 10.

maxillaris Beauv., Ins. Afr. et Am., 1805, p. 125.

ruber Thun., Vetensk. Acad. Handl., 1814, p. 47.

LYPHIA. Muls. et Rey. Opusc. Ent., 1859, p. 166.

Lindia Blackb., Roy. Soc. S. Aus., 1888, p. 275.

147. *australis* Geb., Cat. Junk., 1911, p. 393 . . . N.S.W., Q., S.A.

angusta Blackb., Roy. Soc. S. Aus., 1888, p. 275 (nom. praeoc.)

148. *grandis* Cart. Cooktown, Q.

149. *tasmanica* Champ., Ent. Soc. Lond., 1894, p. 370 . . . N.S.W., T.

MESOTRETIS. Bates, Ent. Mo. Mag., 1872, p. 151.

150. *ferruginea* Bates, l.c., p. 151 . . . Albany, W.A.

151. *inconstans* Lea, Roy. Soc. S. Aus., 1917, p. 156 . . . Geraldton, W.A.

LATHETICUS. Waterh., Ann. Mag. Nat. Hist., 1880, p. 147.

152. *oryzae* Waterh., l.c., p. 148 . . . Cosmopolitan.

TRIBOLIUM. MacL., Ann. Jav., 1825, p. 47.

Margus Redt., Gatt., 1845, p. 127.

Stene Steph., Ill. Brit. Ins., 1832, p. 9.

153. *confusum* Jacq. du Val., Gen. Col. d'Europe Cat., 1868, p. 181.

. Cosmopolitan.

ferrugineum Muls., Col. Fr. Latigènes, 1854, p. 244.

154. *myrmecophilum* Lea, Roy. Soc. Vic., 1904, p. 383 . . . V.

155. *ferrugineum* F., Mant. Ins., 1787, p. 212 . . . Cosmopolitan

bifoveolatum Duft., Fn. Aust., 1812, p. 304.

castaneum Herbst., Käf., 1797, p. 282.

navale Herbst., l.c., 1792, p. 138.

rubens Cast., Hist. Nat. 1840, p. 220.

testaceum F., Ent. Syst. Suppl., 1798, p. 179.

PALORUS. Muls., Col. Fr. Latigènes, 1854, p. 250.

156. *austrinus* Champ., Ent. Mo. Mag., 1896, p. 30 . . . Damma Isl.

157. *depressus* F., Skriver Naturh. Selsk., 1790 . . . Cosmopolitan.

unicolor Ol., Ent. ii., 1790, p. 12.

158. *eutermophilus* Lea, Mem. Q. Mus., 1921, p. 216 . . . Townsville, Q.

159. *pygmaeus* (*Acthosus*) Cart., Roy. Soc. S. Aus., 1914, p. 225 . . . Q.

160. *ratzeburgi* Wissm., Stett. Ent. Zeit., 1848, p. 77 . . . Cosmopolitan.

ULOMA. Cast., Hist. Nat., 1840, p. 219.

? *Melasia* Muls., Opusc. Ent., 1856, p. 160.

Prioscelida White Voy. Ereb. and Terror, 1846, p. 11.

Acthosus Pasc., Jour. Ent., 1863, p. 42.

161. *brunnea* Cart., Linn. Soc. N.S.W., 1906, p. 251 . . . N.S.W.

162. *laticornis* Cart. Kurrajong, N.S.W.
 163. *ovalis* Perroud., Soc. Linn. Lyon., 1864, p. 121 N.S.W., V., T.
 164. *sanguinipes* (*Tenebrio*) F., Sys. Ent., p. 256 Q., N.S.W., V.
 consentanea Perroud., Soc. Linn. Lyon., 1864, p. 119.
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 169. *diaperinus* Panz., Fn. Germ., 1797, p. 16 Cosmopolitan.
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 176. *minuta* (*Acthosus*) Cart., l.c., 1906, p. 252 N.S.W.
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BRACHYCILIBE. Cart., l.c., 1911, p. 207.
 178. *tasmanica* Cart., l.c., 1919, p. 148 Wilmot, Tas.
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THORICTOSOMA. Lea, Roy. Soc. S. Aus., 1919, p. 257.
 179. *cremogaster* Lea W.A.
 180. *ectatommae* Lea, l.c., p. 258 W.A.
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183. *camelum* Cart., Linn. Soc. N.S.W., 1911, p. 188 . . . Berowra, N.S.W.
 184. *floccosum* Pasc., Ann. Mag. Nat. Hist., 1870, p. 100 . . . N.S.W., Q.
 185. *lacordairei* Macl., Linn. Soc. N.S.W., 1888, p. 519 . . Illawarra, N.S.W.
 186. *latum* Cart., l.c., 1910, p. 115 N.W.A.
 187. *nigrum* Cart., l.c., 1905, p. 178 N.S.W.
 188. *submaculatum* Breme, Mon., p. 25 N.S.W.
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190. *acuticollis* Macl., Linn. Soc. N.S.W., 1888, p. 523 Q.
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 201. *cereus* Macl., Linn. Soc. N.S.W., 1888, p. 545 W.A.
 202. *confusus* Macl., Ent. Soc. N.S.W., 1872, p. 283 Q.
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 208. *darlingensis* Cart., Linn. Soc. N.S.W., 1919, p. 149 . . . Bourke, N.S.W.
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 210. *depressiusculus* Macl., Linn. Soc. N.S.W., 1888, p. 533 S.A.
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 215. *gilesi* Cart., l.c., 1919, p. 150 Broome, W.A.
 216. *gracilicornis* Blackb., Roy. Soc. S. Aus., 1907, p. 291 W.A.
 217. *granulatus* Germ., Linn. Ent., 1848, p. 197 S.A.
 218. *granuliger* Macl., Linn. Soc. N.S.W., 1888, p. 537 N.S.W., Vic.
 219. *guerini* Breme, Mon., 1842, p. 36 W.A.
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 220. *hackeri* Cart., Linn. Soc. N.S.W., 1922, p. 74 Nat. Park, Q.
 221. *insignis* Blackb., Roy. Soc. S. Aus., 1887, p. 277 S.A.
 222. *insularis* Breme, Mon., 1842, p. 30 N.A.
 223. *interruptus* Cart., Linn. Soc. N.S.W., 1920, p. 227 . . . Kimberley, W.A.

224. *kollari* Breme, Mon., 1842, p. 32 W.A.
 225. *laticollis* Pasc., Ann. Mag. Nat. Hist., 1869, p. 285 N.S.W.
 226. *litigiosus* Pasc., l.c., p. 283 Sydney, N.S.W.
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 246. *puncticollis* Cart., Linn. Soc. N.S.W., 1910, p. 121 N.W.A.
 247. *punctipennis* Macl., l.c., 1888, p. 544 Q.
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 256. *silphoides* Breme, Mon., 1842, p. 42 N.Q.
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 259. *solidus* Cart., l.c., 1910, p. 117 Rockhampton, Q.
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 262. *sternalis* Cart., l.c., 1911, p. 183 S.Q.
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 290. *frenchi* Cart., l.e., 1910, p. 112 Phillips R., W.A.
 291. *fulvohirtus* Lea, l.e., 1896, p. 288 Dongarra, W.A.
 292. *georgei* Cart., l.e., 1910, p. 103 Albany, W.A.
 293. *gilesi* Cart., l.e., 1910, p. 104 Perth, W.A.
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314. *rugosipennis* Cart., Linn. Soc. N.S.W., 1910, p. 107 Bridgetown, W.A.
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316. *sparsus* Cart., Linn. Soc. N.S.W., 1910, p. 110 Onslow, W.A.
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318. *squamosus* Pasc., Ann. Mag. Nat. Hist., 1869, p. 286 Murray R., Vic.
. and S.A.
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323. *bicolor* Cart., l.c., 1910, p. 83 Shark Bay, W.A.
324. *bremei* Hope, Ent. Soc. Lond., 1848, p. 54 W.A.
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326. *denticeps* Cart., l.c., 1911, p. 191 Shark Bay, W.A.
327. *depressus* Cart., l.c., 1919, p. 153 Geraldton, W.A.
328. *excisifrons* Cart., l.c., 1910, p. 86 Onslow, W.A.
329. *gagates* Breme, Mon., 1842, p. 52 Perth, W.A.
contractus Hope, Ent. Soc. Lond., 1848, p. 53.
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333. *rotundatus* Breme, Mon., 1842, p. 50 W.A.
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345. *clathratus* Macl., l.c., p. 663 Fitzroy Downs, Q.
346. *confirmatus* Pasc., Ann. Mag. Nat. Hist., 1870, p. 102 W.A.
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350. *crenulatus* Macl., l.c., p. 663 N.A.
 351. *darwinii* Lea, Linn. Soc. N.S.W., 1896, p. 284 Dongarra, W.A.
 352. *emarginatus* Guér., Voy. Coq., 1830, p. 105 N.S.W., V.
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 355. *geminatus* Macl., l.c., 1888, p. 668 Guyra, N.S.W.
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 358. *incisus* Pasc., Ann. Mag. Nat. Hist., 1870, p. 101 (pl. xvi, f. 13)
 Mudgee, N.S.W.
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 362. *laevicollis* F. (*Silpha*) Sys. Ent., p. 73 Endeavour R., Q.
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 364. *latus* Blackb., l.c., 1889, p. 869 N.W.V., S.A.
 365. *latipes* Cart., l.c., 1911, p. 201 Bell, Q.
 366. *limbatus* Pasc., Ann. Mag. Nat. Hist., 1869, p. 287 V.
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 368. *luridus* Haag, Verh. Ver. Hamb., 1878, p. 97 Q.
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 374. *novemcostatus* Cart., l.c., 1911, p. 198 N.W.A.
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 377. *ovalis* Macl., l.c., 1888, p. 661 Gayndah, Q.
 378. *pascoei* Macl., l.c., p. 669 S.A.
 379. *perlaevis* Cart., l.c., 1911, p. 200 Carnarvon, W.A.
 380. *pronus* Cart., l.c., 1921, p. 312 Flat Rock, N.S.W.
 381. *punctatus* Cart., l.c., 1924, p. 34 Shoalhaven, N.S.W.
 382. *rugosipennis* Macl., l.c., p. 664 Monaro, N.S.W.
 *383. *rugosus* Boisd., Voy. Astrol., 1835, p. 264 A.
 (Unidentified in collections.)
 384. *satelles* Blackb., Linn. Soc. N.S.W., 1889, p. 872 Adelaide, S.A.
 385. *simplex* Hope, Ent. Soc. Lond., 1848, p. 55 S.A., Wn. N.S.W.
 asidoides Pasc., Jour. Ent., 1866, p. 465.
 386. *sphaeroides* Cart., Linn. Soc. N.S.W., 1911, p. 204 Shark Bay, W.A.
 387. *striatipennis* Macl., l.c., 1888, p. 668 Monaro, N.S.W.
 388. *strigiventris* Lea, Roy. Soc. S. Aus., 1915, p. 795 Everard Range, C.A.
 389. *subreticulatus* Cart., l.c., 1918, p. 703 King R., N.A.
 390. *substriatus* Cart., Roy. Soc. S. Aus., 1914, p. 378 Hunter R., N.S.W.
 391. *tarsalis* Hope, Ent. Soc. Lond., 1848, p. 55 Port Lincoln, S.A.
 asperipes Pasc., Ann. Mag. Nat. Hist., 1870, p. 101.

392. *tricarinatus* Blackb., Roy. Soc. S. Aus., 1892, p. 43 C.A.
 393. *wilsoni* Cart., Linn. Soc. N.S.W., 1925, p. 234 (?) W.A.

Subfamily NYCTOZOILINAE.

DYSARCHUS. Pasc., Jour. Ent., 1866, p. 449.

Saragodinus Bates, Ent. Soc. Lond., 1872, p. 269.

394. *batesi* Haag., Jour. Mus. Godeffr., 1879, p. 117 Q.
 395. *duboulayi* Bates, Ent. Soc. Lond., 1872, p. 269 W.A.
 396. *howitti* Bates, l.c., p. 273 W.A.
 397. *irregularis* Cart., Linn. Soc. N.S.W., 1924, p. 537 . . . Stanthorpe, Q.
 398. *odewahni* Pasc., Jour. Ent., 1866, p. 449 S.A.
 399. *tuberculatus* Blackb., Linn. Soc. N.S.W., 1889, p. 873. Port Lincoln, S.A.

ONOSTERRHUS. Pasc., Jour. Ent., 1866, p. 451.

Hypocilibe Bates, Ent. Soc. Lond., 1872, p. 275.

400. *acuticollis* Cart., Ann. Q'land Mus., 1911, p. 14 N.W. Vic.
 401. *batesi* Haag., Verh. Ver. Hamb., 1878, p. 99 Q.
 402. *bos* Cart., Ann. Q'land Mus., 1911, p. 17 (pl. xvi, f. 14) . . S.A., W.A.
 403. *deanei* Cart., l.c., p. 21 W.A.
 404. *duboulayi* Cart., l.c., p. 19 Kookynie, W.A.
 405. *goudiei* Cart., l.c., p. 15 N.W. Vic.
 406. *impunctatus* Haag., Verh. Ver. Hamb., 1878, p. 99 . . Peak Downs, Q.
 407. *kenedyi* Cart., Roy. Soc. S.A., 1914, p. 378 E.A.
 408. *laetus* Blackb., Linn. Soc. N.S.W., 1890, p. 567 S.A.
 409. *laevipennis* Haag., Verh. Ver. Hamb., 1878, p. 100 N.A.
 410. *laevis* Pasc., Jour. Ent., 1866, p. 451 W.A.
 411. *lugubris* Blackb., Linn. Soc. N.S.W., 1890, p. 570 . . Port Lincoln, S.A.
inconspicuus Blackb., l.c., p. 572.

412. *macleani* Bates, Ent. Soc. Lond., 1872, p. 276 S.Q.
 413. *major* Blackb., Linn. Soc. N.S.W., 1890, p. 565 Yilgarn, W.A.
heroína Blackb., Horn. Exp., 1896, p. 279.

414. *marginicollis* Bates, Ent. Soc. Lond., 1872, p. 277 W.A.
 415. *ooldensis* Cart., Linn. Soc. N.S.W., 1918, p. 704 Ooldea, S.A.
 416. *opacus* Bates, Ent. Soc. Lond., 1872, p. 278 Champion Bay, W.A.
 417. *parvus* Cart., Ann. Q'land Mus., 1911, p. 13 Kookynie, W.A.
 418. *punctulatus* Bates, Ent. Mo. Mag., 1873, p. 51 W.A.
 419. *rotundatus* Blackb., Linn. Soc. N.S.W., 1890, p. 568 . . Lachlan R., N.S.W.
 420. *sculpturatus* Blackb., l.c., p. 569 N.S.W.
 421. *sloanei* Blackb., l.c., 1894, p. 103 Urana, N.S.W.
 422. *socius* Cart., Ann. Q'land Mus., 1911, p. 22 Nunga, Q.
 423. *squamosus* Cart., l.c., p. 16 Walgett, N.S.W.
 424. *stepheni* Cart. (*Agasthenes*) Linn. Soc. N.S.W., 1909, p. 133 . . Forbes,
 N.S.W.

425. *vagepunctatus* Haag., Verh. Ver. Hamb., 1878, p. 99 Q.
 426. *veterinosus* Blackb., Roy. Soc. S. Aus., 1900, p. 140 . . Lake Eyre, S.A.
 427. *vittatus* Blackb., Linn. Soc. N.S.W., 1895, p. 104 Q.

AGASTHENES. Bates, Ent. Soc. Lond., 1873, p. 352.

428. *championi* Cart., Linn. Soc. N.S.W., 1910, p. 131 S.A., W.A.
 429. *frenchi* Cart., l.c., 1909, p. 131 Murchison, W.A.
 430. *westwoodi* Bates, Ent. Soc. Lond., 1873, p. 353 S.A. & W.A.

AMPHIANAX. Bates, Ent. Soc. Lond., 1873, p. 350.

431. *subcoriaceus* Bates, l.c., p. 351 N.W. Vic., Eucla, S.A.
goudiei (*Agasthenes*) Cart., Linn. Soc. N.S.W., 1909, p. 129.
euclensis (*Agasthenes*) Cart., l.c., 1910, p. 129.

NYCTOZOILUS. Guér., Voy. Coquille, 1830, p. 92.

432. *approximatus* Blackb., Horn. Exp., 1896, p. 277 C.A.
 433. *carbonarius* Cart., Ann. Q'land Mus., 1911, p. 23 Yetholm, N.S.W.
 434. *carlovillensis* Cart., Linn. Soc. N.S.W., 1922, p. 75 Charleville, Q.
 435. *crassicornis* Blackb., Horn. Exp., 1896, p. 276 C.A.
 436. *crassus* Cart., Linn. Soc. N.S.W., 1924, p. 35 Uralla, N.S.W.
 437. *daemeli* Haag., Verh. Ver. Hamb., 1878, p. 98 Peak Downs, Q.
 438. *denticollis* Cart., Linn. Soc. N.S.W., 1921, p. 314 Stanthorpe, Q.
 439. *deyrollei* Bates, Ent. Soc. Lond., 1873, p. 348 (pl. xvi., f. 15)
 Fern Hills, V.
 440. *hardcastlei* Cart., Ann. Q'land Mus., 1911, p. 24 Cunnamulla, Q.
 441. *inaequalis* Blackb., Horn. Exp., 1896, p. 277 C.A.
 442. *irregularis* Blackb., l.c., p. 278 Alice Springs, C.A.
 443. *lateralis* Cart., Linn. Soc. N.S.W., 1925, p. 235 Yeppoon, Q.
 444. *macleayi* Cart. Coonabarabran, N.S.W.
 445. *marginatus* Cart., Linn. Soc. N.S.W., 1921, p. 315 Wyreema, Q.
 446. *mastersi* MacL., Ent. Soc. N.S.W., 1872, p. 284 Gayndah, Q.
 447. *obesus* Guér., Voy. Coqu., 1830, p. 93 S.Q.
 448. *parvus* Cart., Linn. Soc. N.S.W., 1917, p. 705 Townsville, Q.
 449. *puncto-costatus* Cart., l.c., 1921, p. 314 Wyndham, N.W.A.
 450. *pusillus* Cart., l.c., 1924, p. 35 Rockhampton, Q.
 451. *reticulatus* Bates, Ent. Soc. Lond., 1872, p. 274 N.S.W.
 452. *ruficornis* Cart., Ann. Q'land Mus., 1911, p. 28 Camooweal, Q.
 453. *sarcostatus* Champ., Ent. Soc. Lond., 1894, p. 388 N.W.A.
 454. *vermiculatus* Cart., Ann. Q'land Mus., 1911, p. 26 Augathella, Q.

ONONYCTUS. Cart., Roy. Soc. S. Aus., 1914, p. 382.

455. *sulcatus* Cart., l.c., p. 383 Narrabri, N.S.W.
AETHALIDES. Bates, Ent. Mo. Mag., 1873, p. 50.

456. *costipennis* Cart., Linn. Soc. N.S.W., 1909, p. 135 Cootamundra, N.S.W.
 457. *cori* Cart., Roy. Soc. S. Aus., 1914, p. 380 Wallomombi, N.S.W.
 458. *decemcostata* Cart., Linn. Soc. N.S.W., 1909, p. 138 Grampians, V.
 459. *marginicollis* Cart., l.c., p. 136 N.W.V.
 460. *punctipennis* Bates, Ent. Mo. Mag., 1873, p. 51 Murray R., V.
 461. *stepheni* Cart., Roy. Soc. S. Aus., 1914, p. 379 Howell, N.S.W.

STYRUS. Bates, Ent. Soc. Lond., 1873, p. 348.

462. *batesi* Haag., Verh. Ver. Hamb., 1878, p. 98 Q.
elongatulus Bates, Ent. Soc. Lond., 1873, p. 350.
 463. *clathrides* Blackb., Linn. Soc. N.S.W., 1890, p. 573 V.
 464. *elongatulus* MacL., Ent. Soc. N.S.W., 1872, p. 284 N.S.W. & S.Q.
 465. *laticollis* Cart., Linn. Soc. N.S.W., 1909, p. 127 Waleha, N.S.W.
 466. *puncticollis* Cart., l.c., 1919, p. 156 Capertee, N.S.W.

BYALLIUS. Pasc., Ann. Mag. Nat. Hist., 1869, p. 42.

467. *angustatus* Cart., Linn. Soc. N.S.W., 1925, p. 236 Nerriga, N.S.W.
 468. *kosciuskoanus* Cart., Linn. Soc. N.S.W., 1908, p. 412. Kosciusko, N.S.W.
 469. *laticollis* Cart., Roy. Soc. S. Aus., 1914, p. 385 Cooma, N.S.W.
 470. *mastersi* Cart., Linn. Soc. N.S.W., 1909, p. 139 Condobolin, N.S.W.
 471. *ovensensis* Cart., l.c., p. 139 Bright, V.
 472. *punctatus* Cart., l.c., 1919, p. 158 Cunningham, V.
 473. *reticulatus* Pasc., Ann. Mag. Nat. Hist., 1869, p. 43 Gippsland, V.
 474. *revolutus* Cart. (*Styrus*) Roy. Soc. S. Aus., 1914, p. 381 Marmor, Q.

ONOGLYPTA. nom. nov.

- aglypta* Gebien, Fn. Süd. Aus., 1908, p. 329.
 475. *gebieni* Cart., Ann. Q'land Mus., 1911, p. 29 Kookynie, W.A.

476. *octocostata* Geb., Fn. Sudw. Aus., 1908, p. 331 . . . Daydawn, W.A.
ONOTRICHUS. Cart., Ann. Q'land Mus., 1911, p. 30.
 477. *lateralis* Cart., l.c., p. 31 Shark Bay, W.A.
 478. *minor* Cart., Roy. Soc. S. Aus., 1914, p. 384 Cue, W.A.
TRICHOSARAGUS. Blackb., Linn. Soc. N.S.W., 1889, p. 1269.
 1269.
 479. *pilosellus* Blackb., l.c., p. 1271 Yorke Pen., S.A.

Subfamily COSSYPHINAE.

- COSSYPHUS*. Ol., Ent., iii., 1795, p. 1.
 480. *odewahni* Pasc., Jour. Ent., 1866, p. 468 N.S.W., S.A.

Subfamily BRISEINAE.

- BRISES*. Pasc., Ann. Mag. Nat. Hist., 1869, p. 145.
Ephidonius Pasc., l.c., p. 151.
 481. *acuticornis* Pasc. (*Ephidonius*) l.c., p. 152 S.A.
 482. *blairi* Cart., Linn. Soc. N.S.W., 1914, p. 58 (pl. xvii., f. 19) C. and N.A.
 483. *duboulayi* Bates (*Ephidonius*) Ent. Soc. Lond., 1872, p. 279
 Champion Bay, W.A.
 484. *granulatus* Cart., Linn. Soc. N.S.W., 1921, p. 316. Broken Hill, N.S.W.,
 S.A.
 485. *parricollis* Blackb. (*Ephidonius*) Roy. Soc. S. Aus., 1895, p. 52 . . C.A.
 486. *trachynotoides* Pasc., Ann. Mag. Nat. Hist., 1869, p. 146 . . S.A., W.A.

Subfamily TENEBRIONINAE.

- SLOANEA*. Cart., Linn. Soc. N.S.W., 1916, p. 209.
 487. *costata* Cart., l.c., p. 210 (pl. xvii., f. 17) . . Mt. Barrington, N.S.W.
ASPHALUS. Pasc., Ent. Soc. Lond., 1868, p. 12.
 488. *ebeminus* Pasc., l.c., p. 12 N.S.W., S.Q.
 489. *striatus* Cart., Linn. Soc. N.S.W., 1911, p. 209 Gympie, Q.
HYPPAULAX. Bates, Ent. Soc. Lond., 1868, p. 259.
Chileone Bates, l.c., p. 264.
 490. *amphiata* Bates, Ann. Mag. Nat. Hist., 1874, p. 19 W.A.
 var. *Parryi* Bates, l.c., p. 20.
 491. *deyrollei* Bates (*Chileone*) Ent. Soc. Lond., 1868, p. 264. Tenterfield,
 N.S.W.
 492. *foveata* Cart., Linn. Soc. N.S.W., 1914, p. 59 (pl. xvii., f. 16)
 Tenterfield, N.S.W., & S.Q.
 493. *insularis* Hope (*Platynotus*) Ent. Soc. Lond., 1842, p. 76 N.A.
iridescent Blackb., Linn. Soc. N.S.W., 1888, p. 1432.
 494. *interioris* Blackb., l.c., p. 1432 McDonnell Ranges.
 495. *marginata* Bates, Ent. Soc. Lond., 1868, p. 261 N.S.W., S.Q.
sinuaticollis Bates, l.c., p. 261.
opacicollis Mael., Ent. Soc. N.S.W., 1872, p. 285.
 496. *nanus* Cart., Linn. Soc. N.S.W., 1921, p. 316 N.A.
 497. *opacula* Bates, Ann. Mag. Nat. Hist., 1874, p. 18 . . Rockhampton, Q.
 498. *orcus* Pasc., Jour. Ent., 1866, p. 453 W.A. to Q.
 var. *acutangula* Bates, Ann. Mag. Nat. Hist., 1874, p. 21.
 499. *oralis* Bates, Ent. Soc. Lond., 1868, p. 263 N.S.W., Q.
oblonga Bates, l.c., p. 263.
gayndahensis Mael., Ent. Soc. N.S.W., 1872, p. 284.
 (?) *crenata* Boisd. (*Upis*) Voy. Astrol., 1835, p. 255.
 500. *puncticollis* Cart., Linn. Soc. N.S.W., 1914, p. 61 Onslow, W.A.
 501. *pygmaeus* Cart. Port Darwin, N.T.

502. *spenceri* Cart., l.c., p. 62 Flora R., N.A.
 503. *tarda* Bates, Ent. Soc. Lond., 1868, p. 262 Wide Bay, Q.
 504. *tenuistriata* Bates, Ann. Mag. Nat. Hist., 1874, p. 21 N. Q.
HYDISSUS. Pasc., Ann. Mag. Nat. Hist., 1869, p. 148.
 505. *feronioides* Pasc. (*Nyctobates*) Jour. Ent., 1866, p. 453 . . N.S.W., Q.
ENCYALESTHUS. Motsch., Schrenck's Reise, 1860, p. 139.
 Cholipus Pasc., Jour. Ent., 1866, p. 471.
 Pachyurgus J. Lec., Class. Col. N. Amer., 1866, p. 230.
 506. *atro-viridis* Mael., Linn. Soc. N.S.W., 1888, p. 311 N.Q.
 var. *iridipennis* Fairm., Not. Leyd. Mus., 1897, p. 220.
 507. *excisipes* Cart., l.c., 1914, p. 63 Kuranda, Q.
 508. *punctipennis* Pasc., Jour. Ent., 1866, p. 472 N.S.W., Q.
 509. *tuberculiceps* Cart., Roy. Soc. S. Aus., 1914, p. 226 Q.
SETENIS. Motsch., Bull. Mosc., 1872, ii., p. 24.
 Pediris Motsch., l.c.
 510. *sulcigera* Boisd. (*Upis*) Voy. Astrol., 1835, p. 256 C. York.
 longipes Motsch., Bull. Mosc., 1872, p. 28.
PROMETHIS. Pasc., Ann. Mag. Nat. Hist., 1869, p. 148.
 511. *angulata* Er., Arch. Nat., 1842, i., p. 174 . . . N.S.W., V., T., S.A.
 512. *lobicollis* Cart., Linn. Soc. N.S.W., 1914, p. 65 Kookynie, W.A.
 513. *major* Cart., l.c., p. 64 Gympie, Q.
 514. *minor* Cart., l.c., p. 67 Rockhampton, Q.
 515. *nigra* Bless., Hor. Soc. Ent. Ross., 1861, p. 91 . . . V., N.S.W., Q.
 lethalis Pasc., Ann. Mag. Nat. Hist., 1869, p. 148.
 516. *opaca* Cart., Roy. Soc. S. Aus., 1914, p. 386 Craven, N.S.W.
 517. *quadricollis* Pasc., Ann. Mag. Nat. Hist., 1869, p. 149 . . V., N.S.W., Q.
 pascoei Mael., Ent. Soc. N.S.W., 1872, p. 285.
MENEPHILUS. Muls., Col. Fr. Latigènes, 1854, p. 291.
 518. *coerulescens* Haag., Verh. Ver. Hamb., 1878, p. 100 N.S.W., Q.
 519. *colydioides* Er., Arch. Nat., 1842, p. 175 Q., N.S.W., V., T.
 var. *parvulus* Mael., Ent. Soc. N.S.W., 1872, p. 285.
 520. *corvinus* Er., l.c., p. 175 N.S.W., V., T., S.A.
 cyanipennis Hope, Ent. Soc. Lond., 1842, p. 79.
 521. *humilis* Er., Arch. Nat., 1842, p. 174 T.
 522. *laetus* Cart., Linn. Soc. N.S.W., 1914, p. 69 N.Q.
 523. *pulcher* Cart., l.c., 1924, p. 36 Deeral (?) N.Q.
 524. *rectibasis* Cart., l.c., 1914, p. 70 Dorrigo, N.S.W.
 525. *ruficornis* Champ., Ent. Soc. Lond., 1894, p. 391 . . . Q., N.S.W., V., T.
 var. *aeneus* Cart., Linn. Soc. N.S.W., 1905, p. 179. Syd., N.S.W.
 var. *azuripennis* Cart., l.c., 1914, p. 53 N.Q.
 526. *sydneyanus* Blackb., Roy. Soc. S. Aus., 1893, p. 132 . . . Q., N.S.W.
OECTOSIS. Pasc., Ann. Mag. Nat. Hist., 1869, p. 149.
 527. *cylindrica*, Germ. (*Upis*) Linn. Ent., 1848, p. 198 . . S.A., V. & W.A.
 longicollis Cart. (*Menephilus*) Linn. Soc. N.S.W., 1920, p. 231.
TEREMENES. Cart., Linn. Soc. N.S.W., 1914, p. 54.
 528. *convexinsulcus* Hope (*Menephilus*) Ent. Soc. Lond., 1842, p. 79.
 Q., N.S.W., V., T., S.A.
 servulus Pasc. (*Meneristes*) Ann. Mag. Nat. Hist., 1869, p. 151.
 (?) *nigerrimus* Boisd. (*Tenebris*) Voy. Astrol., 1835, p. 254.
 529. *longipennis* Hope, Ent. Soc. Lond., 1842, p. 79 . N.S.W., V., T., S.A.
 530. *socius* Cart., Linn. Soc. N.S.W., 1914, p. 68 N.Q.
MENERISTES. Pasc., Ann. Mag. Nat. Hist., 1869, p. 150.

531. *australis* Bless., Hor. Soc. Ent. Ross., 1861, p. 94 . . Q., N.S.W., V., T.
 (?) Boisd., Voy. Astrol., p. 254.
laticollis Pasc., Ann. Mag. Nat. Hist., 1869, p. 150.
 (?) Boisd., Voy. Astrol., 1835, p. 253 (*Baryscelis*).
angulicollis Motsch., Bull. Mosc., 1872, p. 30.
 var. *intermedius* Pasc., Ann. Mag. Nat. Hist., 1869, p. 150.
 (?) *politus* Boisd., Voy. Astrol., 1835, p. 253
 (?) *politus* Boisd., Voy. Astrol., 1835, p. 253 (*Baryscelis*).
532. *dentipes* Cart., Linn. Soc. N.S.W., 1914, p. 71 C. York, Q.
 533. *laticor* Cart., l.e., p. 75 Dorriggo, N.S.W.
 534. *porosus* Cart., l.e., 1918, p. 717 Atherton, N.Q.
 535. *proximus* Cart., l.e., 1914, p. 74,—1916, p. 214 N.S.W., Q.
 536. *tibialis* Cart., l.e., p. 73 (pl. xvii., f. 18) N.S.W., V.
TENEBRIO L., Syst. Nat., 1758, p. 417.
537. *molitor* L., l.e., p. 417 Cosmopolitan.
 538. *obscurus* F., Ent. Syst., 1792, p. 111 Cosmopolitan.
- TOXICUM** Latr., Hist. Nat., 1804, p. 297.
539. *brevicorne* Pasc., Jour. Ent., 1866, p. 454 Q., N.S.W., V.
parvicorne Macl., Ent. Soc. N.S.W., 1872, p. 281.
curvicorne Blackb., Roy. Soc. S. Aus., 1887, p. 276.
spretum Blackb., l.e., p. 276.
540. *gracile* Pasc., Ann. Mag. Nat. Hist., 1881, p. 438 N.S.W., V.
 541. *insigne* Cart., Linn. Soc. N.S.W., 1914, p. 76 N.S.W., S.A.
 542. *punctipenne* Pasc., Jour. Ent., 1866, p. 454 N.A., Q., N.S.W.
distinctum Macl., Ent. Soc. N.S.W., 1872, p. 281.
addendum Blackb., Linn. Soc. N.S.W., 1888, p. 1431.
Plateuri Pic., Mel. Exot. Ent., vi., 1913, p. 19.
543. *quinquecornutum* Cart., l.e., 1914, p. 77 Bellingen, N.S.W.
- PARATOXICUM** Champ., Ent. Soc. Lond., 1894, p. 380.
544. *iridescens* Champ., l.e., p. 381 T. and Vic. Alps.
- SYNERCTICUS** Newm., Entomol., 1842, p. 403.
545. *heteromerus* Newm., l.e., p. 403 Q., N.S.W., V., S.A.
piceus Pasc., Jour. Ent., 1862, p. 325.
- TANYLYPA** Pasc., Ann. Mag. Nat. Hist., 1869, p. 152.
546. *morio* Pasc., l.e., p. 153 T.
 Subfamily HETEROTARSINAE.
- NOTOPRATAEUS** Cart., Linn. Soc., 1924, p. 37.
547. *litoralis* Cart., l.e., p. 37 Townsville, Q.
 Subfamily CYPHALEINAE.
- LEPISPILUS** Westw., Arcan., Ent., 1841, p. 44.
Tyndarismus Pasc., Ann. Mag. Nat. Hist., 1869, p. 294.
548. *longitarsis* Pasc. (*Tyndarismus*) l.e. N.S.W., V., T.
 549. *rotundicollis* Blackb., Roy. Soc. S. Aus., 1889, p. 140 . . S.A., N.S.W., V.
 550. *stygianus* Pasc., Ann. Mag. Nat. Hist., 1869, p. 290 . N.S.W. & V. Alps.
 551. *sulcicollis* Boisd., Voy. Astrol., 1835, pp. 248, 268 . . . N.S.W., V., T.
- PLATYPHANES** Westw., Ent. Soc. Lond., 1849, p. 206.
552. *chalcopteroides* Cart., Linn. Soc. N.S.W., 1913, p. 75 Q.
 553. *clarki* Cart., l.e., p. 74 Tenterfield, N.S.W.
 554. *creber* Blackb., Roy. Soc. S. Aus., 1892, p. 225 N.Q.
 555. *cyancipennis* Cart., Linn. Soc. N.S.W., 1915, p. 538. Tambourine Mt., Q.
 556. *cyaneus* Pasc., Jour. Ent., 1866, p. 472 Cairns, Q.
 557. *denticollis* Cart., Linn. Soc. N.S.W., 1914, p. 78 Warra, Q.
 558. *ellipticus* Cart., l.e., 1913, p. 81 Cairns, Q.

559. *elongatulus* Mael., l.c., 1888, p. 308 Mossman R., Q.
 560. *frenchi* Cart., l.c., 1913, p. 79 N.S.W., Q.
 561. *gibbosus* Westw., Ent. Soc. Lond., 1849, p. 206 N.S.W. & Q.
 562. *kershawi* Cart. (*Moerodes*) Linn. Soc. N.S.W., 1913, p. 100 Q.
 563. *minor* Cart., l.c., p. 77 Dorrigo, N.S.W.
 564. *oblongus* Waterh., Ent. Soc. Lond., 1874, p. 547 Q.
 godeffroyi Haag., Verh. Ver. Hamb., 1878, p. 100.
 565. *parallelus* Cart., Linn. Soc. N.S.W., 1913, p. 78 Dorrigo, N.S.W.
 566. *quadrifoveatus* Cart., l.c., p. 80 Q.
 var. *subangulatus* Cart., l.c., p. 81.
 567. *rugosulus* Cart., l.c., 1914, p. 80 Rockhampton, Q.
 568. *similis* Cart., l.c., 1917, p. 708 Q.
 569. *striatopunctatus* Westw. (*Prophanes*) Ent. Soc. Lond., 1849, p. 205.
 V., N.S.W., & Q.
 570. *superbus* Blackb., Linn. Soc. N.S.W., 1895, p. 105 N.Q.
LAONICUS. Haag., Verh. Ver. Hamb., 1878, p. 100.
 571. *dämeli* Haag., l.c., p. 101, 124 C. York, Q.
 572. *pilosus* Haag., l.c., p. 100, 124 N.Q.
OPIGENIA. Pasc., Ann. Mag. Nat. Hist., 1869, p. 288.
 573. *browni* Cart., Linn. Soc. N.S.W., 1914, p. 81 Southern Cross, W.A.
 574. *vittata* Westw. (*Platyphanes*) Ent. Soc. Lond., 1849, p. 206 V.
 iridescens Pasc., Ann. Mag. Nat. Hist., 1869, p. 289.
TRISILUS. Haag., Verh. Ver. Hamb., 1878, p. 101.
 575. *femoralis* Haag., l.c., p. 101, 127 Gayndah, Q.
 576. *punctipennis* Cart. (*Platyphanes*) Linn. Soc. N.S.W., 1911, p. 210.
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TIMENECA. Cart., Linn. Soc. N.S.W., 1914, p. 78.
 Ctimene Bates, Ent. Soc. Lond., 1873, p. 359.
 577. *breweri* Bates, l.c., p. 360 Albany, W.A.
CAMPANOTIPHILUS. Lea, Roy. Soc. S.A., 1914, p. 257.
 578. *fimbriicollis* Lea, l.c., p. 258 Beverley, W.A.
MITROTHORAX. Cart., Linn. Soc. N.S.W., 1914, p. 78.
 Mitrephorus Cart. (nom. praecoc.) l.c., 1913, p. 83.
 579. *convexicollis* Cart., l.c., p. 83 Tambourine Mt., Q.
EUTOREUMA. Cart., Linn. Soc. N.S.W., 1914, p. 78.
 Toreuma Cart. (nom. praecoc.) l.c., 1913, p. 84.
 580. *cupreum* Cart., l.c., p. 85 N.Q.
 581. *minor* Cart., l.c., 1924, p. 37 S.Q.
OLISTHAENA. Er., Arch. Nat., 1842, p. 177.
 Decialma Pasc., Ann. Mag. Nat. Hist., 1869, p. 291.
 582. *nitida* Er., Arch. Nat., 1842, p. 178 T.
 erichsoni Champ. (*Decialma*) Ent. Soc. Lond., 1894, p. 395.
 583. *pascoei* Bates (*Decialma*) l.c., 1873, p. 358 Q.
 584. *rufoaenea* Cart., Linn. Soc. N.S.W., 1914, p. 82 Tambourine Mt., Q.
 585. *tenuitarsis* Pasc., Ann. Mag. Nat. Hist., 1869, p. 291 N.S.W., V.
APHECTUS. Cart., nom. nov.
 Hectus Pasc., Ann. Mag. Nat. Hist., 1869, p. 289.
 586. *anthracinus* Pasc., l.c., p. 290 Rockhampton, Q.
BOLBOPHANES. Cart., Linn. Soc. N.S.W., 1913, p. 86.
 587. *dumbrelli* Lea, Linn. Soc. N.S.W., 1895, p. 603 N.S.W.
 588. *rugatus* Cart., l.c., 1913, p. 87 N.S.W., Q.
 589. *sericatus* Cart., l.c., 1919, p. 159 Brisbane, Q.
 590. *varicolor* Cart., l.c., 1913, p. 88 N.Q.

- HEMICYCLUS.** Westw., Arcan. Ent., 1841, p. 44.
 591. *flavipes* Cart., Linn. Soc. N.S.W., 1913, p. 89 Dorrigo, N.S.W.
 592. *punctulatus* Pasc., Journ. Ent., 1866, p. 472 V.
 593. *reamuri* Casteln., Hist. Nat., 1840, p. 224 N.S.W., Q.
 grandis Westw., Arcan. Ent., 1841, p. 44.
 metallicus Westw., l.c., p. 44.
OSPIDUS. Pasc., Jour. Ent., 1866, p. 467.
 594. *chrysomeloides* Pasc., l.c., p. 468 S.A.
 paropsoides Cart., Linn. Soc. N.S.W., 1909, p. 128.
 595. *gibbus* Blackb., Roy. Soc. S. Aus., 1897, p. 94 Cape York, Q.
 596. *major* Cart., Linn. Soc. N.S.W., 1920, p. 231 N.Q.
ALTES. Pasc., Mag. Nat. Hist., 1869, p. 288.
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 597. *binodosus* Pasc. (*Chartopteryx*) Jour. Ent., 1862, p. 327 Q.
 598. *westwoodi* Bates (*Apomestris*) Ent. Soc. Lond., 1873, p. 358. N.S.W., V.
AMARYGMIMUS. Bates, Ent. Soc. Lond., 1873, p. 354.
 599. *duboulayi* Bates, l.c., p. 355 Champion Bay, W.A.
CHARTOPTERYX. Westw., Arcan. Entom., 1841, p. 43.
 600. *blackburni* Cart., Linn. Soc. N.S.W., 1913, p. 91 S.A.
 601. *childreni* Westw., Arcan. Ent., 1841, p. 44 N.S.W.
 602. *glaber* Mael., Linn. Soc. N.S.W., 1888, p. 310 N.S.W., Q.
 603. *imperialis* Cart., l.c., 1908, p. 407 (pl. xvii., f. 21) N.Q.
 604. *mastersi* Mael., Ent. Soc. N.S.W., 1872, p. 287 Gayndah, Q.
 605. *planus* Cart., Linn. Soc. N.S.W., 1913, p. 90 Acacia Cr., N.S.W.
 606. *victoriensis* Blackb., Roy. Soc. S. Aus., 1892, p. 226 N.S.W., V.
CYPHALEUS. Westw., Arcan. Ent., 1841, p. 43.
 607. *aereus* Waterh., Ent. Mo. Mag., 1877, p. 72 Brisbane, Q.
 608. *cupricollis* Mael., Ent. Soc. N.S.W., 1872, p. 287 Gayndah, Q.
 609. *formosus* Westw., Arcan. Ent., 1841, p. 43 N.S.W., Q.
 var. *iopterus* Westw., l.c., p. 43.
 insignitus Pasc., Jour. Ent., 1862, p. 327.
 610. *fulgidipennis* Boisd. (*Chrysobalus*) Voy. Astrol., 1835, p. 267. N.S.W., Q
 Schmeltzi Haag., Verh. Ver. Hamb., 1878, p. 101.
 611. *rugosus* Gray, Griff. Anim. Kingd., 1832 N.S.W
 aterrimus Gray, l.c., p. 22.
OREMASIS. Pasc., Jour. Ent., 1866, p. 470.
 Oremasis Pasc., Jour. Ent., 1866, p. 470.
 612. *cupreus* Gray, Griff. Anim. Kingd., 1832, p. 22 N.S.W.
 613. *haagi* Bates, Ent. Soc. Lond., 1873, p. 356 Q.
CYCLOPHANES. Cart., Linn. Soc. N.S.W., 1913, p. 92.
 614. *gloriosus* Cart., l.c., p. 94 Dorrigo, N.S.W.
 615. *splendens* Cart., l.c., p. 96 Tambourine Mt., Q.
 616. *variegatus* Cart., l.c., p. 93 Dorrigo, N.S.W.
PARAPHANES. Mael., Linn. Soc. N.S.W., 1888, p. 308.
 617. *nitidus* Mael., l.c., p. 309. Q.
PROPHANES. Westw., Ent. Soc. Lond., 1849, p. 203.
 Moerodes Waterh., Ent. Mo. Mag., 1877, p. 72.
 [See my note Linn. Soc. N.S.W., 1917, p. 717, also l.c., 1914, p. 72.]
 618. *aculeatus* Westw., l.c., p. 204 N.S.W., Q.
 westwoodi Mael., Ent. Soc. N.S.W., 1872, p. 287.
 619. *brevicostatus* Cart., Linn. Soc. N.S.W., 1922, p. 75 Kuranda, Q
 620. *brevispinosus* Cart., l.c., 1913, p. 99 N.Q.
 621. *browni* Cart., l.c., 1914, p. 83 N.Q.

622. *ducalis* Cart., l.c., 1913, p. 97 (pl. xvii, f. 20) N.Q.
 623. *mastersi* Pasc., Ann. Mag. Nat. Hist., 1871, p. 357 Gayndah, Q
chalybeipennis Macl., Ent. Soc. N.S.W., 1872, p. 286.
ANAUISIS. Bates, Ent. Soc. Lond., 1873, p. 355.
 624. *macleayi* Bates, l.c., p. 356 Champion B., W.A.
 625. *metallescens* Westw. (*Prophanes*) Ent. Soc. Lond., 1849, p. 204. N.S.W.
spinosus Waterh., l.c., 1874, p. 546.
 626. *quadrispinosus* Waterh. (*Cyphaleus*) l.c., p. 545 N.S.W. & Q.
tricolor Haag. (*Prophanes*) Verh. Ver. Hamb., 1878, p. 101.
LYGESTIRA. Pasc., Jour. Ent., 1866, p. 470.
 627. *lata* Waterh., Ent. Mo. Mag., 1877, p. 72 N.S.W., S.Q.
 628. *simplex* Westw. (*Prophanes*) Ent. Soc. Lond., 1849, p. 205, N.S.W., V.,
 S.A.
BARYTIPHA. Pasc., Ann. Mag. Nat. Hist., 1869, p. 292.
 629. *socialis* Pasc., l.c., p. 292 V.
MITHIPPIA. Pasc., Ann. Mag. Nat. Hist., 1869, p. 293.
 630. *aurita* Pasc., l.c., p. 293 N.S.W., S.A.
 631. *jansoni* Bates, Ent. Soc. Lond., 1873, p. 359 W.A.

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- TITAENA.** Er., Arch. Naturg., 1842, p. 178.
 632. *alcyonea* Er., l.c., p. 180 T., W.A.
 var. *ruficollis* Bates, Ann. Mag. Nat. Hist., 1874, p. 104.
 633. *columbina* Er., l.c., p. 179 T., V., N.S.W.
rugosa Blanch., Voy. Pol. Sud., 1853, p. 178.
 var. *viridis* Bates, Ann. Mag. Nat. Hist., 1874, p. 103.
 634. *minor* Cart., Linn. Soc. N.S.W., 1913, p. 104 . . . Tambourine Mt., Q.
 635. *pulchra* Bates, Ann. Mag. Nat. Hist., 1874, p. 103 . . . Moruya, N.S.W.
 636. *tasmanica* Champ., Ent. Soc. Lond., 1894, p. 396 T.
 637. *tyrrhera* Cart., Linn. Soc. N.S.W., 1913, p. 103 Guyra, N.S.W.
 638. *varicolor* Haag., Verh. Ver. Hamb., 1878, p. 102 N.Q.
THESILEA. Haag., Verh. Ver. Hamb., 1878, p. 103.
 639. *cuprina* Fairm., Rev. Zool., 1849, p. 451 N.Q.
CHARIOTHECA. Pasc., Jour. Ent., 1860, p. 125.
Chariothes Cart., Linn. Soc. N.S.W., 1914, p. 78.
 640. *brevis* Cart. (*Menepphilus*) Linn. Soc. N.S.W., 1914, p. 69 . . . N.S.W., Q.
 641. *doddi* Cart., l.c., 1924, p. 38 N.Q.
 642. *planicollis* Fairm. (*Thesilea*) Rev. Zool., 1849, p. 451 N.Q.
oblonga Blanch. (*Olisthaena*) Voy. Pol. Sud., 1853, p. 169.
cupripennis Pasc., Jour. Ent. 1860, p. 126.
 ? *australasiae* Motsch. (*Augolesthus*) Bull. Mosc., 1872, p. 35.
 643. *striato-punctata* Macl. (*Decialma*) Linn. Soc. N.S.W., 1888, p. 310. N.Q.
viridipennis Macl., l.c., p. 311.
 644. *subviolacea* Cart., l.c., 1914, p. 84 N.Q.
 645. *varipennis* Cart., l.c., 1925, p. 237 N.Q.
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 646. *amaroides* Pasc. (*Chariotheca*) Ann. Mag. Nat. Hist., 1862, p. 463.
 (pl. xvii, f. 22) Lizard Is.
 647. *besti* Blkb. (*Chariotheca*) Linn. Soc. N.S.W., 1895, p. 105 N.Q.
 648. *punctipennis* Cart. l.c., 1924, p. 38 Nat. Park, Q.
ESPITES. Pasc., Ann. Mag. Nat. Hist., 1882, p. 32.

649. *basalis* Pasc., l.c., p. 32. C. York, Q.
 ? *sumptuosus* Hope (*Tetraphyllus*) Ent. Soc. Lond., 1842, p. 78.
 aurobasalis Fairm. (*Encyrtus*) Ann. Leyd. Mus., 1893, p. 41.

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- Atryphodes* Pasc., Ann. Mag. Nat. Hist., 1869, p. 37.
 Thoracophorus Hope, Col. Man., 1840, p. 188.
650. *acutangulus* Bates, Ent. Mo. Mag., 1879, p. 131 Mt. Wilson, N.S.W.
 aeripennis Blackb., Roy. Soc. S. Aus., 1892, p. 226.
 var. *constrictus* Cart., Linn. Soc. N.S.W., 1919, p. 160.
651. *aeneus* Bates, Ent. Mo. Mag., 1879, p. 131 Port Stephens, N.S.W.
 var. *macleayensis* Cart., Linn. Soc. N.S.W., 1919, p. 162
 Macleay R., N.S.W.
652. *aericollis* Pasc., Ann. Mag. Nat. Hist., 1869, p. 38 Ourimbah, N.S.W.
 batesi Cart., Linn. Soc. N.S.W., 1906, p. 243.
653. *alternatus* Cart., l.c., 1919, p. 163 Wingham, N.S.W.
654. *aratus* Pasc., Jour. Ent., 1866, p. 479 Pine Mt., Q.
655. *armipes* Bates, Ent. Mo. Mag., 1879, p. 71 Rockhampton, Q.
656. *asperatus* Cart., Linn. Soc. N.S.W., 1916, p. 213. Barrington Mt., N.S.W.
657. *aureus* Cart., l.c., 1906, p. 241 Grose Valley, Blue Mt., N.S.W.
658. *australis* Cart., l.c., p. 242 S. N.S.W., V.
659. *bisulcatus* Cart., l.c., 1911, p. 216 Dalveen, Q.
660. *brevicollis* Redt., Reise Novara, 1868, p. 130 Monaro, N.S.W.
661. *caperatus* Pasc., Ann. Mag. Nat. Hist., 1869, p. 40 New England, N.S.W.
 var. *tachlanensis* Cart., Linn. Soc. N.S.W., 1906, p. 244.
- *662. *captiosus* Bates, Ent. Mo. Mag., 1879, p. 131 C. York, Q.
663. *carinatus* Cart., Linn. Soc. N.S.W., 1909, p. 143 Mt. Garnet, N.Q.
664. *castelnaudi* Pasc., Ann. Mag. Nat. Hist., 1869, p. 38.
 Moss Vale to Bulli, N.S.W.
665. *clypeatus* Cart., Roy. Soc. S. Aus., 1914, p. 399 Guyra, N.S.W.
666. *coeruleo-niger* Cart., Linn. Soc. N.S.W., 1906, p. 250. Bulahdelah, N.S.W.
667. *coerulescens* Cart., l.c., 1921, p. 317 Eungai, N.S.W.
668. *connexus* Haag., Verh. Ver. Hamb., 1878, p. 102 C. York, Q.
669. *cordicollis* Pasc., Ann. Mag. Nat. Hist., 1869, p. 38 N.S.W., S.Q.
670. *crassicornis* Bates, Ent. Mo. Mag., 1879, p. 74 Wide Bay, Q.
671. *crenulicollis* Bates, l.c., p. 132 Endeavour R., Q.
672. *curvipes* Bates, l.c., p. 73 N.S.W. & S.Q.
673. *distinctus* Bates, l.c., p. 132 Wingham, N.S.W.
674. *dorrigoensis* Cart., Linn. Soc. N.S.W., 1911, p. 846 Dorrigo, N.S.W.
675. *egerius* Pasc., Jour. Ent., 1866, p. 478 N.S.W. & S.Q.
676. *encephalus* Pasc., Ann. Mag. Nat. Hist., 1869, p. 39 Gayndah, Q.
677. *errans* Pasc., Jour. Ent., 1866, p. 479 S.Q.
 fraternalis Bates, Ent. Mo. Mag., 1879, p. 72.
 volgipes Bates, l.c., p. 72.
678. *excisicollis* Cart., Linn. Soc. N.S.W., 1920, p. 236 Eidsvold, Q.
679. *femoratus* Bates, Ent. Mo. Mag., 1879, p. 71 N.S.W. & S.Q.
 var. *subdentatus* Cart., Linn. Soc. N.S.W., 1911, p. 484
 (Coff's Harb.).
680. *flevipes* Cart., l.c., 1922, p. 77 Ravenshoe, Q.
681. *foveatus* Cart., l.c., 1924, p. 538 Stanthorpe, Q.
682. *grandis* Bates, Ent. Mo. Mag., 1879, p. 75 (pl. xvii., f. 24) Blue Mts.,
 N.S.W.

683. *haagi* Bates, l.c., p. 133 Macleay R., N.S.W.
 684. *harrisoni* Cart., Linn. Soc. N.S.W., 1925, p. 239 . . Barrington, N.S.W.
 685. *hopsoni* Cart., l.c., p. 238 Barrington, N.S.W.
 686. *howitti* Pasc., Ann. Mag. Nat. Hist., 1869, p. 37 . . National Park, N.S.W.
 687. *humeralis* Bates, Ent. Mo. Mag., 1879, p. 133 . . Wauchope, N.S.W.
 688. *interstitialis* Cart., Linn. Soc. N.S.W., 1916, p. 211 . Barrington, N.S.W.
 689. *iridipes* Cart., l.c., 1911, p. 845 Coff's Harb., N.S.W.
 690. *kershawi* Cart., l.c., 1919, p. 161 Townsville, Q.
 691. *laticollis* Cart., l.c., 1911, p. 217 Oberon, N.S.W.
 692. *longipes* Bates, Ent. Mo. Mag., 1879, p. 73 Tweed R., N.S.W.
 693. *macleayi* Pasc., Jour. Ent., 1866, p. 478 Tweed R., N.S.W.
 licinoides Redt., Reise Novara, 1868, p. 129.
 694. *marginatus* Cart., Linn. Soc. N.S.W., 1920, p. 233 . . Mittagong, N.S.W.
 695. *mastersi* Macl., Ent. Soc. N.S.W., 1872, p. 288 Gayndah, Q.
 simulans Haag, Verh. Ver. Hamb., 1878, p. 102.
 angulatus Bates, Ent. Mo. Mag., 1879, p. 75.
 chalcus Bates, l.c., p. 74.
 696. *metallicus* Cart., Linn. Soc. N.S.W., 1920, p. 234 Bunya Mt., Q.
 697. *mimus* Cart., l.c., 1909, p. 141 Tambourine Mt., Q.
 698. *nasutus* Cart., l.c., 1924, p. 539 Port Macquarie, N.S.W.
 699. *opacicollis* Macl., Ent. Soc. N.S.W., 1872, p. 288 Gayndah, Q.
 700. *pithecius* Pasc., Ann. Mag. Nat. Hist., 1869, p. 39 S.Q.
 701. *politicollis* Bates, Ent. Mo. Mag., 1879, p. 73 . . Hunter R., N.S.W.
 fergusoni Cart. (*Otrintus*) Linn. Soc. N.S.W., 1911, p. 212.
 702. *punctostriatus* Cart., Linn. Soc. N.S.W., 1906, p. 246. Ourimbah, N.S.W.
 703. *pygmaeus* Cart., l.c., p. 247 Eden, N.S.W.
 704. *quadridentatus* Waterh., Ent. Soc. Lond., 1875, p. 205. Port Bowen, Q.
 705. *regularis* Cart., Linn. Soc. N.S.W., 1920, p. 234 . . Toronto, N.S.W.
 706. *rotundicollis* Cart., l.c., 1905, p. 413 Atherton, Q.
 707. *rugosus* Cart., l.c., 1906, p. 248 Wyong, N.S.W.
 708. *sexsulcatus* Cart., l.c. Barrington, N.S.W.
 709. *tibialis* Cart., l.c., 1911, p. 219 Dalveen, Q.
 710. *undulaticostis* Cart., l.c., 1920, p. 235 Moruya, N.S.W.
 711. *undulatus* Cart., Roy. Soc. S. Aus., 1914, p. 400 . . Comboyne, N.S.W.
 712. *victoriae* Cart., Linn. Soc. N.S.W., 1922, p. 76 Vict. Alps.
 713. *walckenaeri* Hope, Col. Man., 1840, p. 189 Sydney, N.S.W.
 (?) *dilaticollis* Guér., Voy. Coq., 1830, p. 100.
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- NOTOTRINTUS.** Cart.
 714. *acaciensis* Cart., Linn. Soc. N.S.W., 1911, p. 214 Acacia Cr., N.S.W.
 715. *hackeri* Cart., l.c., 1924, p. 40 Nat. Park, Q.
 716. *jacksoni* Cart., l.c., 1905, p. 180 (pl. xvii, f. 25) Dorrigo, N.S.W.
 717. *striatus* Cart., l.c., 1906, p. 253 Byron B., N.S.W.
- OTRINTUS.** Pasc., Jour. Ent., 1866, p. 483.
 718. *behri* Germ., Ent., iii., 1848, p. 196 N.S.W., V., S.A.
 719. *cylindricus* Cart., Linn. Soc. N.S.W., 1911, p. 211 Q.
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 720. *aruspex* Pasc., l.c., p. 12, 42 Illawarra, N.S.W.
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721. *equestris* Pasc., Ann. Mag. Nat. Hist., 1882, p. 28 . . . North N.S.W.
 722. *nitidus* Blackb., Linn. Soc. N.S.W., 1891, p. 533 Q.
APASIS. Pasc., Ann. Mag. Nat. Hist., 1869, p. 139.
 723. *beptegenoides* Cart., Linn. Soc. N.S.W., 1909, p. 145 . . . Alps, V.
 724. *howitti* Pasc., Ann. Mag. Nat. Hist., 1869, p. 140 Vie.
 var. *longicollis* Cart., Linn. Soc. N.S.W., 1909, p. 146. Alps, V.
 725. *puncticeps* Lea, l.c., 1896, p. 293 Mt. Kosciusko, N.S.W.
 726. *sinuaticollis* Cart., l.c., 1911, p. 846 Dorrigo, N.S.W.
LICINOMA. Pasc., Ann. Mag. Nat. Hist., 1869, p. 140.
 727. *aerea* Cart., Linn. Soc. N.S.W., 1920, p. 240 Dorrigo, N.S.W.
 728. *angusticollis* (*Cardiothorax*) Cart., l.c., 1906, p. 240
 Clarence R., N.S.W.
 729. *apasoides* Cart., l.c., 1920, p. 241 Forrest, V.
 730. *coerulea* Cart., l.c., 1924, p. 541 Stanthorpe, Q.
 731. *commoda* (*Adelium*) Pasc., Ann. Mag. Nat. Hist., 1869, p. 139 . . . T.
 732. *cyclocollis* Cart., Roy. Soc. S.A., 1914, p. 392 Kuranda, Q.
 733. *elata* Pasc., Ann. Mag. Nat. Hist., 1870, p. 103 Wide B., Q.
 violacea MacL., Ent. Soc. N.S.W., 1872, p. 292.
 734. *gilesi* Cart., Roy. Soc. S. Aus., 1914, p. 392 W.A.
 735. *illidgei* Cart., Linn. Soc. N.S.W., 1924, p. 540 Nat. Park, Q.
 736. *major* Cart., l.c., p. 540 Nat. Park, Q.
 737. *meridiana* Cart., l.c., 1920, p. 242 S.A.
 738. *monticola* Black. (*Daedrosis*) Roy. Soc. S.A., 1892, p. 227.
 Blue Mts., N.S.W.
 punctalatera Cart., Linn. Soc. N.S.W., 1919, p. 169.
 739. *nitida* Pasc., Ann. Mag. Nat. Hist., 1869, p. 140 V.
 victoriae (*Daedrosis*) Blackb., Linn. Soc. N.S.W., 1891, p. 533.
 740. *nitidissima* Lea, l.c., 1898, p. 587 Clarence R., N.S.W.
 741. *nodulosa* (*Adelium*) Champ., Ent. Soc. Lond., 1894, p. 404 . . . T.
 742. *pallipes* Blackb., Linn. Soc. N.S.W., 1891, p. 542 N.S.W., V.
 743. *puncticeps* Cart., l.c., 1924, p. 41 Bowral, N.S.W.
 744. *splendens* Cart., l.c., p. 541 Stanthorpe, Q.
 745. *subcanaliculata* Cart., l.c., 1921, p. 318 Mt. Macedon, V.
 746. *sylvicola* Blackb., Roy. Soc. S.A., 1894, p. 219 . . Forest Reefs, N.S.W.
 var. *montium* Cart., l.c., 1914, p. 391.
 747. *tasmanica* (*Adelium*) Champ., Ent. Soc. Lond., 1894, p. 403 . . . T.
 748. *truncata* Cart., Linn. Soc. N.S.W., 1920, p. 243 V.
 749. *umbilicata* Cart., l.c., 1924, p. 41 Dorrigo, N.S.W.
ADELIUM. Kirby, Linn. Soc. Lond., 1818, p. 420.
 Tropidopterus Blanch., Hist. Nat., 1845, p. 37.
 750. *abbreviatum* Boisd., Voy. Astrol., 1835, p. 281 Tas.
 impressum Blanch., Voy. Pole. Sud., 1853, p. 177.
 var. *latum* Pasc., Jour. Ent., 1866, p. 482.
 var. *dentatum* Cart., Linn. Soc. N.S.W., 1919, p. 167.
 var. *foveatum* Cart., l.c., 1909, p. 147.
 var. *lomondense* Cart., l.c., 1919, p. 167.
 751. *aequale* Blackb., Linn. Soc. N.S.W., 1891, p. 539 . . Port Lincoln, S.A.
 752. *aerarium* Pasc., Ann. Mag. Nat. Hist., 1869, p. 133 . . Darling Downs, Q.
 753. *alpicola* Blackb., Linn. Soc. N.S.W., 1891, p. 536 Alps, V.
 754. *angulicollis* Casteln., Hist. Nat., 1840, p. 236 N.S.W., V.
 succisum Pasc., Jour. Ent., 1866, p. 480.
 755. *arboricola* Cart., Linn. Soc. N.S.W., 1911, p. 220 . . Acacia Cr., N.S.W.

756. *augurale* Pasc., Jour. Ent., 1866, p. 480 . . . North N.S.W. & S.Q.
 757. *auratum* Pasc., l.c., p. 481 . . . North N.S.W. & S.Q.
 758. *barbatum* Cart., Linn. Soc. N.S.W., 1908, p. 274 . . . Endeavour R., Q.
 759. *brevicorne* Bless., Hor. Soc. Ent. Ross., 1861, p. 101. N.S.W., V., T., S.A.
 neophyta Pasc., Ann. Mag. Nat. Hist., 1869, p. 136.
 ? *virescens* Boisd., Voy. Astrol., 1835, p. 281.
 *760. *breviusculum* Geb., Fn. Sud-west. Aus., 1908, p. 344 . . . S.W.A.
 761. *calosomoides* Kirby, Linn. Soc. Lond., 1818, p. 420 . . . Sydney, N.S.W.
 harpaloides Boisd., Voy. Astrol., 1835, p. 280.
 geniale Pasc., Ann. Mag. Nat. Hist., 1869, p. 135.
 762. *canaliculatum* Cart., Linn. Soc. N.S.W., 1908, p. 276 . . . Botany, N.S.W.
 763. *capitatum* Lea, l.c., 1898, p. 584 . . . Wilcannia, N.S.W.
 764. *coeruleum* Cart., l.c., 1906, p. 255 . . . Cairns, Q.
 765. *coxi* Cart., Linn. Soc. N.S.W., 1912, p. 486 . . . Ebor., N.S.W.
 766. *cuprescens* Cart., l.c., 1909, p. 148 . . . Bardoc, W.A.
 767. *cyaneum* Cart., l.c., 1911, p. 222 . . . Kuranda, Q.
 768. *delicatulum* Cart., l.c., 1919, p. 165 . . . Brisbane, Q.
 769. *ellipticum* Blackb., Roy. Soc. S. Aus., 1894, p. 219 . Richmond R., N.S.W.
 770. *fergusoni* Cart., Linn. Soc. N.S.W., 1910, p. 132 . . . Kuranda, Q.
 771. *flavicorne* Cart., l.c., 1912, p. 487 . . . C. Otway, V.
 772. *geminatum* Pasc., Ann. Mag. Nat. Hist., 1870, p. 102. N.N.S.W. & S.Q.
 punctum Cart., Linn. Soc. N.S.W., 1906, p. 257.
 var. *illidgei* Cart., l.c., 1924, p. 542.
 773. *goudiei* Cart., l.c., 1909, p. 150 . . . N.W. Vic.
 774. *hackeri* Cart., l.c., 1908, p. 273 . . . N.Q.
 775. *helmsi* Cart., l.c., 1905, p. 181 (pl. xvii, f. 26) . Port Stephens, N.S.W.
 776. *heterodoxum* Lea, l.c., 1898, p. 582 . . . Mt. Kosciuszko, N.S.W.
 777. *inconspicuum* Blackb., l.c., 1891, p. 536 . . . Kangaroo Isl., S.A.
 778. *interruptum* Cart. (*Daedrosia*) l.c., 1918, p. 710 . . . Cairns, Q.
 779. *irregulare* Cart., Roy. Soc. S. Aus., 1914, p. 411 . . . S.W.A.
 780. *licinoides* Kirby, Linn. Soc. Lond., 1818, p. 421 . . . V., T.
 cisleleoides Er., Arch. Nat., 1842, p. 176.
 helopioides Boisd., Voy. Astrol., 1835, p. 280.
 781. *lindense* Blackb., Linn. Soc. N.S.W., 1891, p. 538 . . . S.A., W.A.
 782. *mcCullochi* Cart., l.c., 1919, p. 166 . . . Walcha, N.S.W.
 783. *murex* Cart., l.c., 1921, p. 317 . . . Wyreema, Q.
 784. *occidentale* Blackb., l.c., 1890, p. 574 . . . S.A., W.A.
 785. *parculum* Macl., Ent. Soc. N.S.W., 1872, p. 290 . . . Gayndah, Q.
 786. *pestiferum* Cart., Linn. Soc. N.S.W., 1908, p. 276 . . . Illawarra, N.S.W.
 787. *pilosum* Pasc., Ann. Mag. Nat. Hist., 1869, p. 134, N.S.W., V. (w.d.).
 scutellare Pasc., l.c., p. 134.
 788. *plicigerum* Pasc., l.c., p. 133 . . . Port Denison, Q.
 var. *rugosicollis* Macl., Ent. Soc. N.S.W., 1872, p. 289.
 789. *politum* Cart., Linn. Soc. N.S.W., 1920, p. 247 . . . Mt. Victoria, N.S.W.
 790. *porcatum* F. (*Carabus*) Sys. Ent., 1774, p. 239 . . . N.S.W. (w.d.)
 caraboides Kirby, Linn. Soc. Lond., 1818, p. 466.
 *791. *punctipenne* Boisd., Voy. Astrol., 1835, p. 278 . . . A.
 792. *pustulosum* Blackb., Linn. Soc. N.S.W., 1891, p. 534 . . . N.S.W., V. (w.d.)
 var. *victoriae* Blackb., l.c., p. 535.
 793. *reductum* Pasc., Ann. Mag. Nat. Hist., 1869, p. 135 . . . N.S.W. & S.Q.
 ancilla Pasc., l.c., p. 136.
 convexiusculum Macl., Ent. Soc. N.S.W., 1872, p. 289.
 nitidum Cart., Linn. Soc. N.S.W., 1906, p. 256.

794. *regulare* Lea, Linn. Soc. N.S.W., 1898, p. 582 .. Forest Reefs, N.S.W.
 795. *reticulatum* Cart., l.c., 1905, p. 181 .. Kurrajong, N.S.W.
 796. *rotundum* Cart., l.c., 1908, p. 275 .. Monaro, N.S.W.
 *797. *rugicolle* Boisd., Voy. Astrol., 1835, p. 279 .. A.
 798. *ruptum* Pasc., Ann. Mag. Nat. Hist., 1869, p. 139 .. Warburton, V.
 799. *scytalicum* Pasc., l.c., p. 137 .. Perth, W.A.
 angulatum Blackb., Linn. Soc. N.S.W., 1891, p. 538.
 800. *similatum* Germ., Linn. Ent., 1848, p. 198 .. V., S.A. (w.d.)
 var. *obesum* Pasc., Jour. Ent., 1866, p. 481.
 801. *simplex* Blackb., Roy. Soc. S. Aus., 1892, p. 44 .. Nullarbor Plains, C.A.
 negligens Geb., Fn. Sudwest. Aus., 1908, p. 343.
 tralaticium Geb., l.c., p. 341.
 802. *sloanei* Cart., Linn. Soc. N.S.W., 1909, p. 151 .. Orange, N.S.W.
 803. *sterepoides* Pasc., Ann. Mag. Nat. Hist., 1869, p. 138 .. Forrest, V.
 804. *striatum* Pasc., Jour. Ent., 1866, p. 481 .. North N.S.W. & S.Q.
 var. *viridipenne* Mael., Ent. Soc. N.S.W., 1872, p. 289.
 805. *subdepressum* Cart., Linn. Soc. N.S.W., 1908, p. 276 .. Eden, N.S.W.
 806. *sublaevigatum* Cart., l.c., 1925, p. 239 .. Yeppoon, Q.
 807. *tenebrioides* Er., Arch. Nat., 1842, p. 176 .. V., T.
 808. *tropicum* Blackb., Linn. Soc. N.S.W., 1891, p. 537 .. N.A.
 809. *vesiculatum* Cart., l.c., 1922, p. 78 .. Kuranda, Q.
 810. *vicarium* Pasc., Jour. Ent., 1866, p. 480 .. Albany, W.A.
 forticorne Geb., Fn. Sudwest. Aus., 1908, p. 343.
 811. *violaceum* Cart., Linn. Soc. N.S.W., 1905, p. 182 .. Tenterfield, N.S.W.
SEIROTRANA. Pasc., Jour. Ent., 1866, p. 483.
 812. *anomala* Cart., Linn. Soc. N.S.W., 1925, p. 240 .. Barrington, N.S.W.
 813. *bimetallica* Cart., l.c., 1909, p. 153 .. Gingken, N.S.W.
 814. *carbo* Cart., l.c., 1925, p. 240 .. Yeppoon, Q. (w.d.).
 815. *catenulata* Boisd., Voy. Astrol., 1835, p. 276 .. Sydney, N.S.W.
 816. *crenicollis* Pasc., Ann. Mag. Nat. Hist., 1869, p. 43 .. Warburton, V.
 denticollis Cart., Linn. Soc. N.S.W., 1908, p. 397.
 817. *elongata* Er., Arch. Nat., 1842, p. 177 .. T.
 818. *femoralis* Mael., Ent. Soc. N.S.W., 1872, p. 292 .. Gayndah, Q.
 819. *geniculata* Haag., Verh. Ver. Hamb., 1878, p. 102 .. Dapto, N.S.W.
 820. *integricollis* Haag., l.c., p. 102 .. N.S.W. (w.d.).
 821. *major* Blackb., Roy. Soc. S. Aus., 1892, p. 228 .. Tamworth, N.S.W.
 822. *mastersi* Pasc., Ann. Mag. Nat. Hist., 1870, p. 104 .. S.Q.
 823. *minor* Cart., Linn. Soc. N.S.W., 1920, p. 248 .. Bunya Mts., Q.
 824. *monticola* Blackb., l.c., 1891, p. 541 .. V.
 825. *nodicauda* Cart., l.c., 1921, p. 318 .. Stanthorpe, Q.
 826. *nosodermoides* Pasc., Ann. Mag. Nat. Hist., 1870, p. 104 .. Wide Bay, Q.
 827. *orphana* Pasc. (*Adelium*) l.c., 1869, p. 138 .. Warburton, V.
 828. *parallela* Germ., Linn. Ent., 1848, p. 199 .. V., S.A. (w.d.).
 congesta Pasc., Jour. Ent., 1866, p. 482.
 829. *proxima* Pasc., Ann. Mag. Nat. Hist., 1869, p. 43 .. South N.S.W., & V.
 830. *punctifera* Mael., Ent. Soc. N.S.W., 1872, p. 291 .. Gayndah, Q.
 831. *repanda* Pasc., Ann. Mag. Nat. Hist., 1869, p. 137. N. N.S.W. & Q. (w.d.)
 dispar Blackb., Linn. Soc. N.S.W., 1891, p. 542.
 832. *simplex* Blackb., l.c., p. 540 .. S.A.
 833. *simsoni* Cart., l.c., 1919, p. 168 .. Ben Lomond, T.
 834. *strigipennis* Bates, Ent. Soc. Lond., 1873, p. 365 .. N.A.

835. *subcancellata* Cart., Roy. Soc. S. Aus., 1914, p. 404 . Tambourine Mt., Q.
 836. *tumulosa* Cart., Linn. Soc. N.S.W., 1922, p. 78 Herberton, Q.
 837. *uniformis* Cart., l.c., 1908, p. 398 Quirindi, N.S.W.
 838. *vertebralis* Cart., l.c., p. 397 Blackheath, N.S.W.
 839. *vicina* Cart., l.c., p. 397 Grose Valley, N.S.W.

BRYCOPIA. Pasc., Ann. Mag. Nat. Hist., 1869, p. 141.

Dinoria Pasc., l.c.

840. *angulata* Cart. (*Daedrosis*) Roy. Soc. S. Aus., 1914, p. 389 V.
 841. *capillata* Cart., Linn. Soc. N.S.W., 1921, p. 319 Stanthorpe, Q.
 842. *cheesmani* Cart., l.c., 1909, p. 154 Alps, V., Southern N.S.W.
 843. *coelioides* Pasc. (*Dinoria*) Ann. Mag. Nat. Hist., 1870, p. 103 T.
 diemenensis Cart., Linn. Soc. N.S.W., 1919, p. 170.
 844. *comata* Cart., l.c., 1920, p. 244 S.A.
 845. *crenaticollis* Cart., l.c., 1908, p. 415 Ourimbah & Blue Mts., N.S.W.
 846. *dubia* Mael., Ent. Soc. N.S.W., 1872, p. 293 Gayndah, Q.
 847. *femorata* Cart., Linn. Soc. N.S.W., 1909, p. 155 Warburton, V.
 848. *globoicollis* Cart., l.c., 1920, p. 244 Launceston, T.
 849. *globulosa* Cart. (*Adelium*) l.c., 1905, p. 184 Kurrajong, N.S.W.
 850. *hexagona* Cart., l.c., 1920, p. 246 Mt. Wellington, T.
 851. *leai* Cart., l.c., p. 245 Launceston, T.
 852. *longipes* Mael., Ent. Soc. N.S.W., 1872, p. 293 Gayndah, Q.
 853. *minor* Cart. (*Adelium*) Linn. Soc. N.S.W., 1905, p. 183. Ourimbah, N.S.W.
 854. *minuta* Lea (*Adelium*) l.c., 1898, p. 583. . . Sydney, Mulwala, N.S.W.,
 Barossa, S.A.
 855. *monilicornis* Mael., Ent. Soc. N.S.W., 1872, p. 289 Gayndah, Q.
 856. *obtusa* Cart., Linn. Soc. N.S.W., 1920, p. 246 Lizard Isl., Q.
 857. *pilosella* Pasc., Ann. Mag. Nat. Hist., 1869, p. 141 . . Mt. Macedon, V.
 858. *punctatissima* Cart., Linn. Soc. N.S.W., 1919, p. 171 . . Exeter, N.S.W.
 859. *quadraticollis* Cart., l.c., 1925, p. 242 Barrington, N.S.W.
 860. *taylori* Cart., l.c., 1906, p. 258 Oberon, N.S.W.
 861. *tuberculifera* Champ., Ent. Soc. Lond., 1894, p. 405 T.

LEPTOGASTRUS. Mael., Ent. Soc. N.S.W., 1872, p. 293.

862. *apiformis* Cart. (*Daedrosis*) Roy. Soc. S. Aus., 1914, p. 389. Dapto, N.S.W.
 863. *cyaneus* Cart., Linn. Soc. N.S.W., 1920, p. 239 Q.
 864. *hirsutus* Cart. (*Daedrosis*) l.c., 1906, p. 254 Mt. Kosciusko, N.S.W.
 865. *mastersi* Mael., Ent. Soc. N.S.W., 1872, p. 294 Gayndah, Q.
 866. *occidentalis* Cart., Linn. Soc. N.S.W., 1920, p. 239 . . Parkerville, W.A.

DAEDROSIS. Bates, Ent. Soc. Lond., 1868, p. 266.

867. *antennalis* Cart., Linn. Soc. N.S.W., 1920, p. 240 . . Mt. Irvine, N.S.W.
 868. *crenatostriata* Bates, Ent. Soc. Lond., 1868, p. 268 N.S.W.
 ambigua Bates, l.c., p. 269.
 pygmaea Haag., Verh. Ver. Hamb., 1878, p. 103.

MACROPERAS. Cart., Roy. Soc. S. Aus., 1914, p. 393.

869. *antennalis* Cart., l.c., p. 394 Moruya, N.S.W.

CORIPERA. Pasc., Jour. Ent., 1866, p. 483.

870. *adamsi* Lea, Linn. Soc. N.S.W., 1911, p. 476 (pl. xvii, f. 27)
 Magnet, Waratah, T.
 871. *bistriata* Cart., l.c., 1908, p. 414 Zeehan, T.
 872. *deplanata* Boisd., Voy. Astrol., 1835, p. 277 Hobart, T.
 873. *distincta* Cart., Linn. Soc. N.S.W., 1905, p. 185 . . Blackheath, N.S.W.

874. *geminata* Lea, l.c., 1898, p. 588 Mt. Kosciuszko, N.S.W.
 875. *mastersi* Macl., Ent. Soc. N.S.W., 1872, p. 292 Gayndah, Q.
 876. *morleyana* Cart., Linn. Soc. N.S.W., 1905, p. 184 Mt. Irvine, N.S.W.
 877. *ocellata* Pasc., Ann. Mag. Nat. Hist., 1869, p. 44 Mt. Macedon, V.
DYSTALICA. Pasc., Ann. Mag. Nat. Hist., 1869, p. 142.
 878. *homogena* Pasc., l.c., p. 142 W.A.
 parallela Lea, Linn. Soc. N.S.W., 1898, p. 586.
 879. *panageicollis* Macl. (*Adelium*) Ent. Soc. N.S.W., 1872, p. 290.
 Gayndah, Q.
 *880. *subpubescens* Bates, Ent. Soc. Lond., 1873, p. 369 (?) N.S.W.
 (Doubtfully distinct from *homogena* Pasc., while the locality given by the
 author has not been confirmed.)
EUTHERAMA. Cart., Roy. Soc. S. Aus., 1914, p. 405.
 881. *cyaneum* Cart., l.c., p. 405 N.A.
CYMBEBA. Pasc., Jour. Ent., 1866, p. 483.
 *882. *dissimilis* Pasc., l.c., p. 484 C. York, Q., & New Caledonia.
 (Unknown in Australian collections. The Australian habitat requires con-
 firmation).

Subfamily HELOPINAE.

- OMOLIPUS.** Pasc., Jour. Ent., 1860, p. 127.
 883. *angustus* Cart., Linn. Soc. N.S.W., 1915, p. 537 Cue, W.A.
 884. *bimetallicus* Cart., l.c., p. 536 Alligator R., N.A.
 885. *coeruleus* Cart., l.c., 1918, p. 711 King R., N.A.
 886. *corvus* Pasc., Jour. Ent., 1860, p. 127 (pl. xvii, f. 28) S.Q.
 grandis Macl., Ent. Soc. N.S.W., 1872, p. 294.
 887. *cyaneus* Pasc., Ann. Mag. Nat. Hist., 1870, p. 98 Nicol Bay and
 Albany, W.A.
 chalybeus Geb., Fn. Sudwest. Aus., 1908, p. 332.
 888. *cyaneipennis* Champ., Ent. Soc. Lond., 1894, p. 394 N.W.A.
 889. *gnesioides* Pasc., Ann. Mag. Nat. Hist., 1869, p. 143. Port Denison, Q.
 890. *laevis* Pasc., l.c., p. 142 C. York, Q.
 891. *nitidus* Cart. Blackall Range, Q.
 892. *oblongus* Bates, Ent. Soc. Lond., 1873, p. 379 Champion Bay, W.A.
 affinis Geb., Fn. Sudwest. Aus., 1908, p. 333.
 893. *ovatus* Cart., Linn. Soc. N.S.W., 1922, p. 79 Recherche Isl.
 894. *parvus* Bates, Ent. Soc. Lond., 1873, p. 379 W.A.
 895. *punctato-sulcatus* Cart., Linn. Soc. N.S.W., 1920, p. 249 N.A.
 896. *socius* Pasc., Ann. Mag. Nat. Hist., 1862, p. 463. Lizard Is. & Kuranda, Q.
 897. *submetallicus* Geb., Fn. Sudwest. Aus., 1908, p. 333 C. York, Q.
CAMPOLENE. Pasc., Jour. Ent., 1863, p. 44.
 898. *nitida* Pasc., l.c., p. 44 Sydney, N.S.W.
AUSTROPEUS. Cart., Linn. Soc. N.S.W., 1924, p. 543.
 899. *pustulosus* Cart., l.c., p. 543 (?) W.A.
TARPELA. Bates, Ent. Mo. Mag., 1870, p. 272.
 Lamperos All., Abeille, 1876, p. 4.
 900. *catenulata* All., Pet. Nouv. Ent., 1877, p. 97 A.
 901. *doddi* Cart., Linn. Soc. N.S.W., 1918, p. 712 N.Q.

Subfamily MERACANTHINAE.

- AXYNAON.** Blackb., Roy. Soc. S. Aus., 1897, p. 34.
 Catopherus Cart., Linn. Soc. N.S.W., 1917, p. 713.

902. *chirmpioni* Blackb., l.c., p. 35 (pl. xvii., f. 29) N.Q.
corpulentus (*Catopherus*) Cart., Linn. Soc. N.S.W., 1917, p. 714.
- BLUOPS.* Cart., Roy. Soc. S. Aus., 1914, p. 227.
903. *verrucosus* Cart., l.c., p. 228 Cairns, Q.
- MELYTRA.* Pasc., Ann. Mag. Nat. Hist., 1869, p. 34.
904. *ovata* Pasc., l.c., p. 34 (pl. xvii., f. 23) T.
- Subfamily AMARYGMINAE.
- AMARYGMUS.* Dahn., Analect. Ent., 1823, p. 60.
- Eurypera* Pasc., Ann. Mag. Nat. Hist., 1870, p. 106.
Dietysus Pasc., Jour. Ent., 1866, p. 486.
Aphylocerus Fairm., Le Natural., 1881, p. 348.
905. *aborigine* Cart., Roy. Soc. S. Aus., 1913, p. 39 Mackay, Q.
906. *aeger* Blackb., Linn. Soc. N.S.W., 1893, p. 90 N.S.W., V., S.A.
907. *anthracinus* Hope, Ent. Soc. Lond., 1842, p. 79 N.S.W., Q.
ellipsoides Pasc., Ann. Mag. Nat. Hist., 1869, p. 350.
908. *bicolor* F., Syst. Ent., p. 118 Cairns, Q.
tardus Blackb., Linn. Soc. N.S.W., 1889, p. 1247.
var. *torridus* Pasc., Ann. Mag. Nat. Hist., 1869, p. 351.
909. *carbo* Cart., Linn. Soc. N.S.W., 1913, p. 38 Cairns, Q.
910. *convexiusculus* Macl., Ent. Soc. N.S.W., 1872, p. 297 Gayndah, Q.
911. *convexus* Pasc., Jour. Ent., 1866, p. 485 Brisbane, Q.
912. *corpulentus* Cart., Linn. Soc. N.S.W., 1913, p. 40 Mt. Chalmers, Q.
913. *cupido* Pasc., Ann. Mag. Nat. Hist., 1869, p. 346 Cooktown, Q.
914. *curvipes* Geb., n.n. for *alienus* Blkb., Linn. Soc. N.S.W., 1893, p. 93. Vic.
915. *diaperoides* Blackb., Linn. Soc. N.S.W., 1888, p. 1387 N.Q.
916. *erubescens* Cart., Roy. Soc. S. Aus., 1914, p. 230 Cairns, Q.
917. *exilis* Pasc., Ann. Mag. Nat. Hist., 1869, p. 346 N.S.W. & V.
918. *femoratus* Cart., Roy. Soc. S. Aus., 1913, p. 43 N.Q.
919. *foveolatus* Macl., Ent. Soc. N.S.W., 1872, p. 297 Gayndah, Q.
920. *frenchi* Blackb., Linn. Soc. N.S.W., 1893, p. 90 (?) Vic.
921. *gemmatus* Cart., Roy. Soc. S. Aus., 1913, p. 44 Kuranda, Q.
922. *hackeri* Cart., l.c., p. 44 C. York, Q.
923. *incultus* Cart., Linn. Soc. N.S.W., 1919, p. 172 N.A.
924. *kershawi* Cart., Roy. Soc. S. Aus., 1913, p. 42 N.S.W.
925. *kurandae* Cart., l.c., p. 45 Kuranda, Q.
926. *lindensis* Blackb., Linn. Soc. N.S.W., 1893 pp. 93, 104. Port Lincoln, S.A.
927. *liliputanus* Blackb., l.c., pp. 91, 104 Wide Bay, Q.
928. *maculicollis* Cart., Roy. Soc. S. Aus., 1914, p. 231 Kuranda, Q.
929. *maurulus* Pasc., Ann. Mag. Nat. Hist., 1870, p. 105 N.S.W. & Q.
930. *metalliceus* Cart., Linn. Soc. N.S.W., 1921, p. 321 Cue, W.A., &
. Tarcoola, S.A.
931. *minimus* Cart., Roy. Soc. S. Aus., 1914, p. 232 Cairns, Q.
932. *minutus* Pasc., Ann. Mag. Nat. Hist., 1869, p. 347 Sydney, N.S.W.
rutilipes Blackb., Linn. Soc. N.S.W., 1893, p. 91.
933. *morio* F., Sys. Ent., 1775, p. 123 N.Q., Papua Isl.
var. *cuprea* Guér., Voy. Coquille, 1830, p. 102.
uniformis Blackb., Linn. Soc. N.S.W., 1889, p. 1272.
tasmanicus Blackb., l.c., 1893, p. 105.
foveoseriatus Fairm., Pet. Nouv. Ent., 1877, p. 187.
foveostriatus Fairm., Soc. Ent. Belg., 1883, p. 29.
picipes Fairm. (*Dietysus*) Tijd. v. Ent., 1893, p. 26.
934. *obtusius* Pasc., Ann. Mag. Nat. Hist., 1869, p. 348 Q.

935. *pascoei* Geb. [n.n. for *cupreus* Pasc. (*Euripera*) Ann. Mag. Nat. Hist., 1870, p. 106] Port Denison, Q.
936. *pectoralis* Blackb., Linn. Soc. N.S.W., 1893, p. 90, 96. Dorriggo, N.S.W.
937. *perplexus* Blackb., l.c., pp. 92, 102 N.A.
queenslandicus Blackb., l.c., pp. 92, 101 N.Q.
938. *pivicornis* Hope, Ent. Soc. Lond., 1842, p. 78 . . . N.S.W., V., S.A.
indigaceus Pasc., Ann. Mag. Nat. Hist., 1869, p. 346.
939. *pinguis* Blackb., Linn. Soc. N.S.W., 1893, pp. 92, 102 . . Cooktown, Q.
940. *porosus* Blackb., l.c., pp. 91, 98 N.Q.
941. *pusillus* Pasc., Ann. Mag. Nat. Hist., 1869, p. 347 . . Illawarra, N.S.W.
942. *regius* Cart., Roy. Soc. S. Aus., 1914, p. 229 Cairns, Q.
943. *rimosus* Blkb., Linn. Soc. N.S.W., 1893, pp. 93, 103. Richmond R. N.S.W.
944. *rufescens* Cart., Roy. Soc. S. Aus., 1913, p. 41 N.W.A.
945. *ruficornis* Blackb., Linn. Soc. N.S.W., 1893, pp. 90, 96. Richmond R.,
. N.S.W.
946. *rugaticollis* Blackb., l.c., pp. 93, 104 Sydney, N.S.W.
947. *semissus* Pasc., Ann. Mag. Nat. Hist., 1869, p. 349 . . Illawarra, N.S.W.
948. *sphaeroides* Cart., Roy. Soc. S. Aus., 1913, p. 38 Q.
949. *stolidus* Blackb., Linn. Soc. N.S.W., 1893, pp. 91, 99. . . Sydney, N.S.W.
. S.Q.
950. *striatus* MacL., Ent. Soc. N.S.W., 1872, p. 297 N.S.W. & Q.
951. *suavis* Blackb., Linn. Soc. N.S.W., 1893, pp. 90, 95 . . Sydney, N.S.W.
952. *sulcatus* Cart., l.c., 1917, p. 715 Melville Is.
953. *tarsalis* Pasc., Jour. Ent., 1866, p. 485 Q.
954. *termitophilus* Lea, Roy. Soc. Vic., 1910, p. 223 Q.
955. *tibialis* Cart., Roy. Soc. S. Aus., 1913, p. 40 N.Q.
956. *tristis* F., Sys. Ent., 1798, p. 102 N.S.W. & Q.
957. *tropicus* Cart., Roy. Soc. S. Aus., 1913, p. 42 N.Q.
958. *tyrrhenus* Pasc., Ann. Mag. Nat. Hist., 1870, p. 105 . . . Albany, W.A.
959. *variolaris* Pasc., l.c., p. 106 Wide B., Q.
- TRICHAMARYGMUS*. Cart., Roy. Soc. S. Aus., 1913, p. 46.
960. *pilosus* Cart., l.c., p. 46 Shark B., Cue, W.A.
- CHALCOPHTERUS*. Bless., Hor. Soc. Ent. Ross., 1861, p. 103.
961. *acutangulus* Blackb., Roy. Soc. S. Aus., 1899, p. 47 C.A.
962. *affinis* Bless., Hor. Soc. Ent. Ross., 1861, p. 109. Q., N.S.W., V., S.A.,
. W.A.
- howitti* Pasc., Ann. Mag. Nat. Hist., 1869, p. 348.
- simius* Blackb., Linn. Soc. N.S.W., 1892, p. 421.
963. *amethystinus* F., Sys. Ent., 1775, p. 124 N.A.
964. *angusticollis* Cart., Roy. Soc. S. Aus., 1913, p. 19 N.Q.
965. *bellus* Blackb., Linn. Soc. N.S.W., 1892, p. 433 N.Q.
966. *boops* Blackb., Roy. Soc. S. Aus., 1899, p. 45 W.A.
967. *bovilli* Blackb., Linn. Soc. N.S.W., 1892, p. 453 N.A.
968. *brevipes* Blackb., l.c., p. 434 N.W. Vic. & S.A.
969. *caesar* Cart., Roy. Soc. S. Aus., 1913, p. 16 (pl. xvii, f. 30)
. Sandstone, W.A.
970. *carinatriceps* Blackb., Linn. Soc. N.S.W., 1892, p. 468 . . Cunnamulla, Q.
971. *carus* Blackb., l.c., p. 430 N.W. Vic. & W.A.
972. *catenulatus* Blackb., l.c., p. 469 Toowoomba, Q.
973. *clypealis* Blackb., l.c., p. 420 S.A.
974. *colossus* Blackb., l.c., p. 454 V., N.S.W., Q.
 laticollis Blackb., l.c., 1893, p. 65.

975. *columbinus* Boisd., Voy. Astrol., 1832, p. 271 N.S.W., V., T.
variabilis Bless., Hor. Soc. Ent. Ross., 1861, p. 108.
vinosus Pasc., Ann. Mag. Nat. Hist., 1869, p. 345.
976. *confusus* Cart., Roy. Soc. S. Aus., 1914, p. 236 S.Q.
opacicollis Blackb. (nec Mael.).
 (?) *resplendens* Boisd., Voy. Astrol., 1832, p. 272.
977. *costatus* Blackb., Roy. Soc. S. Aus., 1899, p. 46 N.W.A.
978. *cribratus* Blackb., l.c., 1901, p. 25 Marmor, Q.
979. *cupreus* F., Sys. Ent., 1775, p. 123 Cairns, Q.
venereus Gmel., Ed. Linn., 1788, p. 1728.
rusticus Blackb., Linn. Soc. N.S.W., 1893, p. 63.
980. *cupripennis* Hope, Ent. Soc. Lond., 1842, p. 78 N.S.W.
froggatti Blackb., Linn. Soc. N.S.W., 1892, p. 436.
981. *cyaneus* Cart., Roy. Soc. S. Aus., 1913, p. 24 N.W.A.
982. *cyaneiventris* Cart., l.c., p. 12 S.A.
longipennis Blackb. (nec Hope).
983. *cyanopterus* Hope, Gray's Zool. Misc., i., 1831, p. 32. ? Nepal, N.S.W., V.
cyaneipennis Hope, Ent. Soc. Lond., 1842, p. 78.
laevicollis Bless., Hor. Soc. Ent. Ross., 1861, p. 110.
coelestis Pasc., Ann. Mag. Nat. Hist., 1869, p. 345.
984. *cylindricus* Blackb., Linn. Soc. N.S.W., 1892, p. 452 N.Q.
985. *difficilis* Blackb., l.c., p. 426 McDonnell Range, C.A.
986. *doddi* Cart., Roy. Soc. S. Aus., 1913, p. 18 Kuranda, Q.
987. *elongatus* Cart., l.c., p. 20 Q.
988. *eremita* Blackb., l.c., 1890, p. 44 Mt. Margaret, W.A.
 (?) *puer* Blackb., l.c., 1899, p. 41.
989. *eyrensis* Blackb., Linn. Soc. N.S.W., 1892, p. 442 S.A.
990. *exoletus* Blackb., l.c., 1893, p. 58 Cooktown, Q.
991. *fastuosus* Germ., Linn. Ent., 1848, p. 200 Q., N.S.W., V., S. Aus., W.A.
obsoletus Mael., Ent. Soc. N.S.W., 1872, p. 296.
confluens Blackb., Linn. Soc. N.S.W., 1892, p. 440.
992. *fervens* Germ., Linn. Ent., 1848, p. 200 Adelaide, S.A.
993. *gilesi* Cart., Roy. Soc. S. Aus., 1913, p. 17 Condon, W.A.
994. *gracilicornis* Blackb., l.c., 1899, p. 45 Yalgoo, W.A.
995. *gracilior* Blackb., Linn. Soc. N.S.W., 1893, p. 66 Cairns, Q.
996. *grandis* Mael., Ent. Soc. N.S.W., 1872, p. 295 Gayndah, Q.
997. *imperialis* Blackb., Linn. Soc. N.S.W., 1892, p. 455 Marmor, Q.
998. *inconspicuus* Blackb., l.c., p. 466 W.A.
999. *interioris* Blackb., l.c., 1890, p. 311 S.A., W.A.
blackburni Geb., Fauna S.W. Aus., 1908, p. 339.
1000. *intermedius* Blackb., Linn. Soc. N.S.W., 1892, p. 439 N.S.W. & S.Q.
arthuri Blackb., Roy. Soc. S. Aus., 1902, p. 319.
1001. *interrogationis* Geb., Fauna S.W. Aus., 1908, p. 337 S.W.A.
1002. *iridescens* Cart., Roy. Soc. S. Aus., 1913, p. 22 Eucla, S.A.
1003. *iridicolor* Bless., Hor. Soc. Ent. Ross., 1861, p. 107 Vic., N.S.W.
1004. *iridiventris* Blackb., Linn. Soc. N.S.W., 1892, p. 458 S.A., W.A.
meyricki Blackb., Roy. Soc. S. Aus., 1890, p. 45.
1005. *iris* Blackb., l.c., 1899, p. 43 Q.
1006. *juvenis* Blackb., Linn. Soc. N.S.W., 1892, p. 429 Portland, V.
1007. *kochi* Blackb., Roy. Soc. S. Aus., 1900, p. 59, L. Eyre, S.A. & Dalby, Q.
1008. *laetus* Blackb., Linn. Soc. N.S.W., 1892, p. 428 Eucla, S.A.
1009. *latifrons* Cart., Roy. Soc. S. Aus., 1913, p. 23 Shark B., W.A.

1010. *leai* Blackb., Linn. Soc. N.S.W., 1893, p. 65 .. (Int.) N.S.W. & N.W.V.
1011. *lepidus* Blackb., l.c., 1892, p. 465 York, W.A.
1012. *longipennis* Hope, Ent. Soc. Lond., 1842, p. 79 .. . Kellerberrin, W.A.
similis Blackb., Linn. Soc. N.S.W., 1892, p. 451.
1013. *longiusculus* Blackb., l.c., 1888, p. 1435 S.A.
1014. *longulus* Blackb., l.c., 1892, p. 455 W.A.
1015. *lucidus* Cart., l.c., 1924, p. 42 Beverley, W.A.
1016. *macer* Blackb., l.c., p. 464 S.A.
1017. *major* Blackb., l.c., p. 449 Cooktown, Q.
1018. *mastersi* Blackb., l.c., 1893, p. 61 N.A.
1019. *mazimus* Cart., Roy. Soc. S. Aus., 1913, p. 15 Cooktown, Q.
cupreus Blackb. (nec F.).
1020. *mercurius* Blackb., Linn. Soc. N.S.W., 1892, p. 449 N.W.A.
var. *croesus* Blackb., Roy. Soc. S. Aus., 1899, p. 44.
1021. *michaelseni* Geb., Fauna, Sudw., Aus., 1908, p. 334 W.A.
1022. *minus* Blackb., Linn. Soc. N.S.W., 1892, p. 450 .. Kalgoorlie, W.A.
1023. *minor* Blackb., l.c., p. 448 W.A.
hartmeyeri Geb., Fauna Sudw. Aus., 1908, p. 336.
1024. *modestus* Blackb., Linn. Soc. N.S.W., 1892, p. 432 .. . Wide B., Q.
1025. *murrayensis* Blackb., l.c., p. 462 S.A.
1026. *mundus* Blackb., Roy. Soc. S. Aus., 1899, p. 48 N.Q.
1027. *neglectus* Blackb., Linn. Soc. N.S.W., 1892, p. 446 .. . N.S.W. & S.Q.
1028. *nigritarsis* Pasc., Jour. Ent., 1866, p. 485 Gayndah, Q.
rufipes Macl., Ent. Soc. N.S.W., 1872, p. 294.
1029. *nobilis* Blackb., Linn. Soc. N.S.W., 1893, p. 63 N.Q.
1030. *oblongus* Blackb., l.c., 1892, p. 464 W.A.
1031. *obscurus* Blackb., l.c., p. 445 N.W.A.
1032. *ocularis* Blackb., l.c., 1893, p. 64 Q.
1033. *opacicollis* Macl., Ent. Soc. N.S.W., 1872, p. 295 .. . N.S.W. & S.Q.
hunterensis Blackb., Linn. Soc. N.S.W., 1893, p. 64.
1034. *palmerensis* Blackb., l.c., p. 65 Q.
1035. *palmerstoni* Blackb., l.c., 1892, p. 443 Q.
1036. *parallellocollis* Geb., Fauna Sudw. Aus., 1908, p. 335 W.A.
1037. *perlongus* Blackb., Linn. Soc. N.S.W., 1892, p. 444 .. . S.A. & W.A.
1038. *picipes* Macl., Ent. Soc. N.S.W., 1872, p. 295 V., N.S.W., Q.
jucundus Blackb., Roy. Soc. S. Aus., 1899, p. 50.
1039. *placidus* Blackb., Linn. Soc. N.S.W., 1892, p. 435 .. . Kellerberrin, W.A.
1040. *plutus* Blackb., l.c., p. 461 N.S.W. & Brisbane, Q.
1041. *polychromus* Pasc., Ann. Mag. Nat. Hist., 1869, p. 348 .. . V. & S.A.
1042. *praetermissus* Cart., Linn. Soc. N.S.W., 1924, p. 42 N.Q.
1043. *prismaticus* Cart., Roy. Soc. S. Aus., 1913, p. 21 .. . Camooweal, Q.
1044. *proditor* Blackb., l.c., 1899, p. 44 N.W.A.
1045. *prospiciens* Blackb., Linn. Soc. N.S.W., 1893, p. 62 W.A.
1046. *proximus* Blackb., l.c., p. 59 Port Denison, Q.
1047. *pulcher* Blackb., l.c., p. 64 Cairns, Q.
1048. *puncticollis* Hope, Ent. Soc. Lond., 1842, p. 78 Perth, W.A.
1049. *punctipennis* Macl., Ent. Soc. N.S.W., 1872, p. 296 .. . Gayndah, Q.
1050. *punctulatus* Blackb., Linn. Soc. N.S.W., 1892, p. 463 .. . N.S.W. & Q.
1051. *purpureus* Germ., Linn. Ent., 1848, p. 199 Adelaide, S.A.
1052. *rugosicollis* Macl., Ent. Soc. N.S.W., 1872, p. 295 .. . Gayndah, Q.
1053. *rugosipennis* Macl., l.c., p. 296 Gayndah, Q.
1054. *scutellaris* Cart., Linn. Soc. N.S.W., 1921, p. 320 .. Kimberley, W.A.

1055. *segnis* Blackb., l.c., 1893, p. 69 N.Q.
 1056. *semiseriatus* Blackb., l.c., 1892, p. 460 N.S.W., V.
 1057. *sericatus* Cart., Roy. Soc. S. Aus., 1913, p. 24 C. York, Q.
 1058. *setosus* Blackb., Linn. Soc. N.S.W., 1892, p. 459 N.Q.
 var. cupriventris Cart., Roy. Soc. S. Aus., 1913, p. 13.
 1059. *smaragdulus* F., Sys. Ent., p. 123 N.A. & N.Q.
 semiticus Pasc., Ann. Mag. Nat. Hist., 1869, p. 349.
 vigilans Blackb., Linn. Soc. N.S.W., 1892, p. 432.
 cairnsi Blackb., l.c., 1893, p. 60.
 triangularis Haag., Verh. Ver. Hamb., 1878, p. 104.
 1060. *sparsus* Blackb., Linn. Soc. N.S.W., 1892, p. 432 N.A.
 1061. *sulcipennis* Hope, Ent. Soc. Lond., 1842, p. 78 Perth, W.A.
 suturalis Pasc., Ann. Mag. Nat. Hist., 1869, p. 350.
 1062. *superbus* Blackb., Linn. Soc. N.S.W., 1890, p. 309 N.A.
 1063. *tenuicornis* Geb., Fauna Sud. W. Aus., 1908, p. 340 W.A.
 1064. *tinctus* Blackb., Linn. Soc. N.S.W., 1892, p. 425 S.A.
 1065. *torpedo* Cart., l.c., 1921, p. 320 N.Q.
 1066. *velutinus* W. S. Macl., King's Surv. Aust., 1827, p. 443, Wyndham, W.A.
 1067. *versicolor* Blackb., Linn. Soc. N.S.W., 1892, p. 424 S.A.
 1068. *viridicollis* W. S. Macl., King's Survey Aust., 1827, p. 443 . . . W.A.
 bicolor Geb., Fauna Sud. W. Aus., 1908, p. 338.
 1069. *vividus* Blackb., Linn. Soc. N.S.W., 1892, p. 438 . . . N.S.W. & Q.
 1070. *zonatus* Blackb., Roy. Soc. S. Aus., 1899, p. 46 N.Q.

Subfamily STRONGYLINAE.

- STRONGYLUM*. Kirby, Linn. Soc. Lond., 1818, p. 417.
 1071. *australe* Mäkl., Mon., 1864, p. 354 Q.
 1072. *corrugatum* Cart., Linn. Soc. N.S.W., 1915, p. 528 N.A.
 1073. *cylindripenne* Cart., l.c., p. 527 Tambourine Mt., Q.
 1074. *longierus* Cart., l.c., 1917, p. 716 Cairns, Q.
 longipes Cart. (nom. praeocc.) l.c., 1915, p. 525.
 1075. *macleayi* Pasc., Jour. Ent., 1863, p. 43 N.S.W. & Q.
 1076. *mastersi* Macl., Ent. Soc. N.S.W., 1872, p. 298 Gayndah, Q.
 1077. *punctithorax* Cart., Linn. Soc. N.S.W., 1915, p. 529 Cairns, Q.
 1078. *ruficollis* Macl., Ent. Soc. N.S.W., 1872, p. 298 Gayndah, Q.
 1079. *vertebrale* Cart., Linn. Soc. N.S.W., 1924, p. 43 (pl. xvii, f. 31) . . N.Q.
EBENOLUS. Fairm., Notes Leyd. Mus., 1897, p. 227.
 1080. *banksi* Cart., Linn. Soc. N.S.W., 1924, p. 43 Moa, Banks Isl.
 1081. *minor* Cart., l.c., p. 44 Moa, Banks Isl.
NOTOSTRONGYLUM. Cart., Linn. Soc. N.S.W., 1915, p. 523.
 1082. *fuscovestitum* Cart., Roy. Soc. S. Aus., 1914, p. 232 . . . Gosford, N.S.W.
 1083. *reticulatum* Mäkl. (*Strongylum*) Mon., 1864, p. 343. Blue Mts., N.S.W.
 and Vic. Alps.
 1084. *rugosicollis* Cart., Linn. Soc. N.S.W., 1915, p. 523 N.Q.
PSEUDOSTRONGYLUM. Kraatz. Deut. Ent. Zeit., 1880, p. 114.
 1085. *viridipenne* Kraatz., l.c., p. 120.

ABBREVIATIONS USED.

- | | | | |
|--------|------------------------|------|----------------------|
| A. | for Australia. | S.A. | for South Australia. |
| N.S.W. | „ New South Wales. | Q. | „ Queensland. |
| V. | „ Victoria. | N.Q. | „ North Queensland. |
| N.W.V. | „ North-west Victoria. | S.Q. | „ South Queensland. |

W.A. for Western Australia.	N.A. for Northern Australia.
N.W.A. „ North-west Australia.	E.A. „ Eastern Australia.
T. „ Tasmania.	C.A. „ Central Australia.
N.T. „ Northern Territory.	C. York „ Cape York Peninsula.

Linn. Soc. N.S.W. for Proceedings of the Linnean Society of N.S.W.

Roy. Soc. S.A. „ Transactions of the Royal Society of South Australia.

Ent. Soc. Lond. „ Transactions of the Entomological Society of London.

Other abbreviations for references are those generally recognised.

A few names [Nos. 79 (*nov. gen. et spec.*), 121, 162, 167, 444, 501, 708, 891] have been included, which are in course of publication in the next Proceedings of the Linnean Society of New South Wales.

An asterisk * placed before a name in the Check-list indicates a species unknown to the author in nature.

EXPLANATION OF PLATES.

Plate xvi.

1. *Zophosis georgii* White.
2. *Tretothorax cleistosoma* Lea.
3. *Exangeltus angustus* Blkb.
4. *Adelodemus excisicollis* Cart.
5. *Ectyche sculpturata* Bates.
6. *Caedimorpha heteromera* King.
7. *Mychestes pascoei* Mael.
8. *Ganyme sapphira* Newm.
9. *Ceropria maculata* Geb.
10. *Platycilibe brevis* Cart.
11. *Uloma westwoodi* Pasc.
12. *Helaeus waitei* Lea.
13. *Saragus incisus* Pasc.
14. *Onosterrhus bos* Cart.
15. *Nyctozoilus deyrollei* Bates.

Plate xvii.

16. *Hypaulax foveata* Cart.
17. *Sloanea costata* Cart.
18. *Meneristes tibialis* Cart.
19. *Brises blairi* Cart.
20. *Prophanes ducalis* Cart.
21. *Chartopteryx imperialis* Cart.
22. *Apterotheca amaroides* Pasc.
23. *Melytra ovata* Pasc.
24. *Cardiothorax grandis* Bates.
25. *Nototrintus jacksoni* Cart.
26. *Adelium helmsi* Cart.
27. *Coripera adamsi* Lea.
28. *Omolipus corvus* Pasc.
29. *Arynaon championi* Blkb.
30. *Chalcopterus caesar* Cart.
31. *Strongylium vertebrale* Cart.

A MONOGRAPH OF THE AUSTRALIAN LORICATES.

(Phylum MOLLUSCA—Order LORICATA.)

By TOM IREDALE and A. F. BASSET HULL.

VI.

Family PLAXIPHORIDAE.

Shells with eight-slit anterior valve, teeth not pectinated, one-slit median valves, and callused posterior valve; the girdle having corneous processes and sutural tufts, rarely with minute scales.

The shells are mostly of large size, the typical species reaching 150 mm. in length, but the subtropical and tropical forms are very small, not exceeding 15 mm. in length. As the group is represented by large species in the extremity of South America, Falkland Islands, New Zealand, and southern Australia—practically a circumpolar Antarctic distribution—so the small forms which occur in Madagascar, southern India, Ceylon, tropical eastern Australia, and New Caledonia show an almost world-encircling distribution with, so far as is at present known, a break in the American region. We anticipate that this hiatus will in time be filled by the discovery of one of the small forms on the Peruvian or Brazilian littoral.

The large forms seem very closely allied, the New Zealand and South American forms of the type being regarded as conspecific. The small forms appear closely related, though geographically so widely separated.

Only two genera are found in Australian Waters:—

Shells large; girdle with corneous processes only *Poneroplax*.

Shells small; girdle clothed with minute scales and having
corneous processes *Aerilamma*.

Genus PONEROPLAX.

Poneroplax Iredale, Proc. Malac. Soc., xi., 1914, 32. Type by original designation *Chiton costatus* Blainville.

Shells of large size, oval and with microscopically wrinkled sculpture and sometimes prominently sculptured in the same manner: anterior valve with eight radial ribs more or less obsolete: an ill-defined or semipustulose rib indicating the lateral area: posterior valve with mucro subterminal: insertion plates and sutural laminae large: anterior valve with eight slits, no pectination: sinus not toothed: no insertion plate in posterior valve, a heavy callus forming instead: girdle leathery, broad, with long corneous processes, rarely bunched at sutures, forming sutural tufts, which are more marked in juvenile than in adult examples, and disappear or become merged in the marginal processes in dried examples.

The following is a key to the species:—

Heavily sculptured:

Sculpture evanescent *albida*.

Sculpture persistent, and wavy on pleural areas *paeteliana*.

Rarely sculptured; smooth as juvenile *costata*.

PONEROPLAX COSTATA.

(Plate xviii., figs. 1, 9, 10.)

Chiton costatus Blainville, Dict. Sci. Nat. (Levrault), xxxvi., 1825, 548. King George Sound, Western Australia. Type in Paris Mus. Thiele, Revision Chitonen (Chun's Zoologica, Heft 56), Pt. 1, 1909, 24, pl. iii., f. 20, 21 (fig. of type).

Chiton glaucus Quoy & Gaimard, Voy. de l'Astrol., Zool., iii., 1835, 376, pl. 74, f. 7-11. D'Entrecasteaux Channel, Tasmania. Type in Paris Mus. (? lost). Not *Chiton glaucus* Gray, Spicilegia Zoologica, 1828, 5.

Euplaciophora modesta Haddon, Zool. Challenger, xv., 1886, Polypl., 33, ex Carpenter M.S. Describes Brit. Mus. No. 67 from Australia. Type in Brit. Mus.

Plaxiphora tasmanica Thiele, Revision Chitonen (Chun's Zoologica, Heft 56), Pt. 1, 1909, 25, pl. iii., f. 24-26. Type in Berlin Mus.

Plaxiphora bednalli Thiele, Id. ib., 1909, 25, pl. iii., f. 27-31. South Australia. Type in Berlin Mus.

Plaxiphora albida May, Illus. Index Tas. Shells, 1923, pl. xv., f. 10.



Fig. 1.

P. costata Blainville. Valves 5 and 8. (After Thiele).

Plaxiphora tasmanica May, Id. ib., 1923, Appendix, pl. xv., f. 10.

Shell large, ovate, depressed, entire sculpture microscopic wrinkling, girdle with long slender nearly straight corneous processes, sutural tufts absent.

Colour brown, flamed with green or yellow, sometimes one or two valves wholly of the latter colours.

Anterior valve with eight indistinct radial waves.

Median valves broad, beaked, a smooth raised rib separating the lateral from the pleural areas.

Posterior valve with mucro almost terminal, no postmucronal area distinguishable, ante-mucronal area as pleural area of median valves.

Girdle leathery, fleshy when alive.

Interior blue, darker medially. Slitting 8—1—0.

Dimensions: 25 x 17 mm. (juvenile figured). Maximum measured: 98 x 44 mm.

Station: On the surface of rocks between tide marks.

Habitat: Western Australia, South Australia. Tasmania, Victoria.

Remarks: A juvenile shell from the type locality is described and figured.

PONEROPLAX ALBIDA.

(Plate xviii., figs. 2, 8, 11.)

Chiton albidus Blainville, Dict. Sci. Nat. (Levrault), xxxvi., 1825, 547. Ile King. Type in Paris Mus. Thiele, Revision Chitonien (Chun's Zoologica, Heft 56), Pt. 1, 1909, 24, pl. iii., f. 22, 23 (fig. of type).

? *Chiton petholatus* Sowerby (and var. *porphyrius*) Mag. Nat. Hist., iv. (Charlesworth), June, 1840, 289. New Holland. Types lost. Conch. Illus., f. 64, 65, and 59.

Chaetopleura conspersa H. Adams & Angas, P.Z.S., 1864, 193. Port Lincoln, South Australia. Type in British Mus.

Plaxiphora petholata var. *conspersa* Pilsbry, Man. Conch., Ser. 1., xiv., 1893, 324.

Plaxiphora costata May, Illus. Index Tas. Shells, 1923, pl. xv., f. 11.



Fig. 2.

P. albidus Blainville. Valves 5 and 8. (After Thiele).

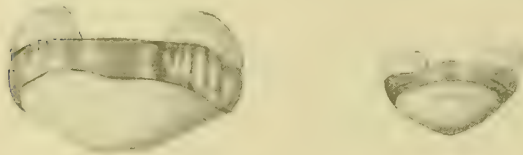


Fig. 3.

P. tasmanica Thiele. Valves 5 and 8. (After Thiele).



Fig. 4.

P. bednalli Thiele. Valves 5 and 8. (After Thiele).

Plaxiphora albidus Ashby & Hull, Aust. Zool., iii., 1923, 83, pl. viii., f. 5 (6). King Island.

Shell large, ovate, subdepressed, sculpture well marked, girdle processes curved.

Colour dark to blackish brown, beaks frequently tipped with white; some valves flamed with green or yellow.

Anterior valve rayed with eight slightly elevated distant ridges, overridden by irregular wavy concentric cording.

Median valves broad, beaked, a prominent lateral rib, cut by wavy concentric lines so as to make it appear seminodulose, a similar ridge forming the posterior border of the lateral areas. Between these two ridges V-shaped wrinkles occur and these persist across the pleural area but vanish medially, the jugal area being faintly microscopically wrinkled.

Posterior valve with the muero subterminal, postmuconal area almost smooth, ante-muconal area wrinkle sculptured as pleural areas.

Girdle very broad, spongy, having corneous processes.

Interior bluish green, darker medially. Slitting 8—1—0.

Dimensions: 30 x 19 mm. juv. Maximum measured: 74 x 38 mm.

Station: On the surface of rocks between tide marks.

Habitat: Tasmania, Victoria, South Australia, Western Australia.

Remarks: An immature specimen from the type locality is described and figured.

The two species here allowed are generally separable at sight, the juveniles showing the distinctions clearly; the adults show variation, according to the station and locality, but are generally recognisable by means of the form of the posterior valve. Thiele's figures drawn from the type specimens are here reproduced. Attention has often been drawn to the variability of these species and up to the present no definite means of distinguishing subspecies is known. At King Island in Bass Strait, and at Port Arthur, South Tasmania, the two species grow side by side, *costata* living higher up and *albida* predominating lower down. At the latter locality the former shell rarely develops obsolete wrinkles with age, but becomes elongate and round backed, lengthening to an elongate oval of large size, the girdle becoming leathery and nude; a fairly large specimen when dried, measured 87 x 42 mm. From Fowler Bay, South Australia, small specimens agreeing with the topotype described have been examined, and from Neptune Island large specimens, 90 x 48 mm., agree with the large ones from Port Arthur, thus showing little variation from west to east. On the other hand *albida* from Port Arthur develops into a comparatively broader shell which never grows so large nor (owing to its station) does its girdle ever lose all its corneous processes; the prominent wrinkling being always present. An average large shell measures 63 x 42 mm. dried.

From Port Arthur also comes a narrow highly elevated shell strongly sculptured, which may be an ecologic variant or even a recognisable subspecies, in which case it might be called *mawlei*.

At Port Lincoln, S.A., a small light coloured highly sculptured form occurs, upon which was based *Chaetopleura conspersa* H. and A. Adams. A feature of the *albida* form is the predominance of the light markings, while in *costata* the darker colour prevails.

PONEROPLAX PAETELIANA.

(Plate xviii. figs. 3, 7, 12.)

Plaxiphora paeteliana Thiele, Revision Chitonon (Chun's Zoologica, Heft 56), Pt. I., 1909, 26, pl. iii., f. 34-36. "Tasmania and Cape York" error = Port Jackson, N.S.W. Type in Berlin Mus.

Plaxiphora costata Iredale, Proc. Mal. Soc., ix., 1910, 157. Caloundra, Queensland.

? *Plaxiphora excurvata* Pilsbry, Man. Conch., Ser. I., xiv., 1893, 327, from Carpenter M.S. Australia? Haines Coll. and Coll. McGill University, Montreal.

Shell large, oval, depressed, round-backed, sculpture strongly wrinkled, girdle

broad, with long nearly straight corneous processes, with larger and thicker ones at sutures.

Colour generally brown flamed with green or yellow, but wholly greyish white examples are not uncommon, while occasional blotches of blue or red are found on some specimens.

Anterior valve concentrically closely wrinkled, the eight radials obsolete or appearing only as waves: the apex smoother.

Median valves with the lateral areas not very well differentiated but bounded by two radial ribs, the intervening space sculptured with wrinkled V sculpture, which appears to cut the radials into nodules, and then pass on to the pleural and turn towards the jugum. This sculpture runs parallel to the edge of the preceding valve, becoming very fine on the jugal area. The posterior rib is similarly carved into about a dozen elongate lozenges, but these are not separated.

Posterior valve with the mucro depressed, nearly terminal, the postmucronal area scarcely defined, the ante-mucronal area sculptured as pleural area.

Girdle very broad, sutural tufts present and distinct in juveniles, but obscure in adults.

Interior pale bluish-green. Slitting 8—1—0.

Dimensions: 33 x 21 mm. juv. 80 x 40 mm. Maximum of examples measured.

Station: On the surface of rocks between tide marks. Juveniles are frequently found in the interstices between tunicates below low water mark.

Habitat: New South Wales, South Queensland.

Remarks: A juvenile shell from Freshwater Bay, near Port Jackson Heads, described and figured. The peculiar sculpture is diagnostic.

Genus *AERILAMMA*.

Aerilamma Hull, Proc. Roy. Soc. Queensland, xxxvi., 1924, 113. Type by original designation *A. primordia*, id. ib.

Shells of small dimensions and tropical distribution, having Plaxiphorid structure, but primitive ornament; the girdle covered with minute scales and bearing sparse corneous processes, the margins spiculose.

To this genus Hull has allotted *Plaxiphora parva* Nierstrasz (Zool. Jahrb., 1906, 501) from Mozambique, and *P. indica* Thiele (Revision Chitonen, 1909, 23) from Ceylon.

AERILAMMA PRIMORDIA.

(Plate xviii., figs. 13-17.)

Aerilamma primordia Hull, Proc. Roy. Soc. Queensland, xxxvi., 1924, 113, pl. xxi., f. 4. Stone Island, Port Denison, Queensland. Type in Queensland Museum.

Shell very small for the family, broadly ovate, not elevated, but carinated; side slopes convex. Colour olive-green, unevenly flecked with reddish-brown and blotched with dark green.

The sculpture of the whole shell is uniformly granulose, the grains somewhat irregular in shape and size, but all high and pointed.

Anterior valve broad and high, apex not beaked, planate.

Median valves: lateral areas distinctly raised, not differentiated, no diagonal, jugum broad, V-shaped, with the pustules small and crowded.

Posterior valve small, rounded, the pustules smaller and tending to a more

regular pattern than on the other valves; mucro prominent, posterior, straight behind.

Girdle wide, spongy, covered with minute, elongate, rounded scales, and having a few corneous processes opposite the sutures; margin spiculose, the under side densely minutely scaly. In dried examples the girdle contracts to one-third of the width when alive.

Interior bluish-green, paler at the edges and the sutural laminae, anterior valve with eight slits, median valves 1-1 slit, posterior valve unslit; callus wide, smooth; eaves projecting; sinus broad.

Dimensions: 7 x 5 mm. (type), maximum of series measured 15 x 9 mm.

Station: The type and several co-types were found on the under side of stones embedded in coral sand and debris between median and low water mark. On Armit Island a colony was found inhabiting a typical Plaxiphorid station in crevices in the rock and amongst clusters of oysters on a rocky promontory, above median tide mark.

Habitat: North Queensland, from Port Curtis to Cooktown.

Remarks: This genus presents an interesting example of the northward migration and synchronous degeneration of Antarctic species, the closely allied genus *Poncroplox* reaching greatest dimensions and occurring in greatest quantity in the sub-Antarctic Islands, Tasmania, and southern Australia.

Family CHITONIDAE.

This family includes the most highly specialised forms, some of the groups being well endowed with ocelli. There appear to be two or three distinct groups represented in the series at present associated under this name. Thus the *Rhyssoplax* series, the *Sypharochiton* series, and the *Lucilina* series are separable at sight, although the variation in the individual genera comprised in the series is not small. Beginning with the *Rhyssoplax* series, it has been shown that the evolution of the species is expressed in the growth stages of any species, and that all the stages are still represented as distinct species, forming an easily recognised chain of development such as is rarely seen in other groups. Commencing with *Delicatoplax*—*Tegulaplax* being a peculiar offshoot—the regular links in the serial chain of development are seen through *Rhyssoplax coxi*, *R. jugosa*, *R. exoptanda*, and *R. tricostalis* into *Mucrosquama carnosa* and *M. verconis*. It is suggested that *Amaurochiton* may be a very specialised ancient ally of this series.

The *Sypharochiton* series shows variation in another way as, while in the former series the variation in sculpture is a marked feature and the scale differentiation is small; in this the sculpture seems to vary very little, though the girdle covering ranges from scales to long spines, and in some genera the posterior valve loses its insertion plate, a callused plate forming in two or three cases independently. It should be noted that no degeneration of the insertion plates has yet been observed in the *Rhyssoplax* series.

The third or *Lucilina* series combines a glossy shell and horny scaleless girdle, the posterior valve varying from a peculiarly well developed one with a large mucro and toothed insertion plate, to a small flattened one with planate terminal mucro and callused insertion plate. An extraordinary variation is seen in *Schizochiton*, which is the only one of the family showing reduction in the slitting of the anterior valve; in addition it shows the largest ocelli, and is characterised by the large fissure in the posterior valve.

Ecologically the whole family may be divided into two groups, (a) Emergent, and (b) Immergent. The first group, like the *Plaxiphoridae*, in their adult stages, take up stations on the surface of rocks above median tide mark, and are therefore exposed to the air for long periods twice daily; some examples in fact remain even above mean high water mark and are only submerged during spring tides or by the surf in rough weather. The emergent group comprises the whole of the *Sypharochiton* series, and *Onithochiton* of the *Lucilina* series. The entire *Rhyssoplax* series is immergent, none being found exposed at any state of the tide. *Lucilina* and *Schizochiton* are sometimes found just above mean low water mark, but always under stones or in crevices of dead coral, and not exposed to the air.

In relation to size of shell, the following dimensions are assigned to the three grades referred to, viz.:—"Small"—under 20 mm. in length; "medium"—20-35 mm., and "large"—over 35 mm., the measurements being of average adults.

Practically the only feature diagnostic of this family is the pectination of the insertion plates. In addition the slitting of the anterior valve is eight or more, the higher number being caused by interslitting. In only one case, *Schizochiton*, is it less, being six or seven.

As a guide to the determination of the groups, the following scheme is proposed.

Girdle scaly:

Teeth finely pectinate:

Scales very small:

Shell practically smooth *Delicatoplax*.

With concentric ridges only *Tegulaplax*.

Scales larger:

Shell with linear sculpture present on central areas . . *Rhyssoplax*.

Scales large and mucronate *Mucrosquama*.

Scales large and rounded:

Sculpture distinctive *Amaurochiton*.

Teeth coarsely pectinate:

Posterior valve strongly toothed: scales large *Sypharochiton*.

Posterior valve weakly toothed: scales small *Squamopleura*.

Girdle semispinose, spines clubshaped, posterior valve callused . . . *Clavartzona*.

Girdle spinose: posterior valve callused *Liolophura*.

posterior valve with toothed insertion plate . . *Amphitomura*.

spines very long *Acanthopleura*.

Girdle leathery: posterior valve callused *Onithochiton*.

posterior valve with prominent toothed insertion plate. *Lucilina*.

Girdle spiculose: posterior valve strongly fissured *Schizochiton*.

Genus DELICATOPLAX, n. gen.

Type *Chiton translucens* Hedley & Hull.

This peculiar form is at present only known from the Peronian Region, and represents the ancestral stage of all the *Rhyssoplacid* forms. In addition the girdle scales are small for this family, but the insertion plates are pectinated, the sinus very narrow but coarsely pectinate, the sutural laminae consequently very large.

DELICATOPLAX TRANSLUCENS.

(Plate xviii., figs. 21-25. Plate xx., fig. 15.)

Chiton translucens Hedley & Hull, Rec. Aust. Mus., vii., 1909, 263, pl. lxxiv., f. 14-18. Vaucluse, Port Jackson, N.S.W. Type in Australian Museum.

Shell large, elevated, carinated, side slopes straight. Colour buff, clouded with olive and sage-green, and microscopically freckled with rufous, in some specimens shaded with orange-red on the lateral areas.

Entire surface finely granulated in quincunx. The general smoothness of the valves is only interrupted by a few impressed growth lines. The lateral areas of the median valves are raised, and there are a few rudimental furrows in the remoter pleural areas. The mucro of the posterior valve is median, sub-prominent.

Girdle broad, covered with small, finely striated, oval, polished, and densely subimbricate scales.

Interior flesh tint passing into green; sinus narrow, deep, denticulate. Slitting 8—1—10, teeth deeply irregularly pectinated on the edge and outside.

Dimensions: 38 x 21 mm. (type); 55 x 30 (maximum).

Station: Under stones below low water mark.

Habitat: New South Wales (Shellharbour, Port Jackson, Port Stephens), Southern Queensland (Caloundra, Point Cartwright).

Remarks: This shell, when alive, presents a beautiful translucent appearance, the prevailing tint being green. It is very clean, being apparently of a nomadic disposition, and therefore less exposed to the attacks of parasites. It prefers smooth surfaces, and is often found on sunken glass bottles. In describing the furrows in the pleural areas the authors used the term "vestigial." In the light of a more critical examination of the evolutionary process of the family, we adopt the view that these furrows are in fact rudimental.

Genus TEGULAPLAX, n. gen.

Type *Chiton howensis* Hedley & Hull.

This curious genus recalls *Rhyssoplax* but the animal is alert and active like that of *Ischnochiton* (*sensu lato*). The elongate shape with the narrow elevated shell and very broad girdle and characteristic sculpture present features easily recognised. It would appear to be an early offshoot from the ancestral *Rhyssoplax* stock which developed a curious sculpture, and has retained it without modification for a long period. When Hedley and Hull described the type species they were unaware that any of the group had been previously known, whereas four species had been introduced in literature:—*Ischnochiton ravanæ* Sykes (Rep. Ceylon Pearl Oyster Fisheries, Suppl. iv., 1903, p. 178, pl. 1, fig. 4, from Ceylon); *Ischnochiton hululensis* Smith (Fauna and Geog. Maldives and Laccadive Arch., Vol. II., 1903, p. 619, pl. xxxvi., figs. 3-6, from Hulule I.); *Chiton imbricatus* Nierstrasz (Siboga Exped. Monog., xlviii., 1905, p. 79, pl. ii., f. 37, pl. vii., figs. 188-194, from the Moluccas) and *Chiton* (*Clathropleura*) *platei* Thiele (Revision Chitonen., pl. ii., 1910, p. 92, pl. ix., f. 46-48, from the Red Sea).

The distribution suggested its discovery in Australian waters, and we now record it owing to the acumen of the dozen of Loricata collectors in Australia, Mr. E. H. Matthews, now in his seventy-sixth year, after whom we name the Australian species.

The whole of the species show a very similar form and sculpture so that it is difficult to determine their exact relationship with the few specimens of all, save *howensis*, yet available.

TEGULAPLAX MATTHEWSI, n. sp.

(Plate xviii., figs. 26, 27.)

Shell small, elongate oval, strongly elevated, carinated, side slopes curved and steep, sculpture characteristic, girdle very broad, scales small striate ovals.

Colour creamy white, the jugal area pinkish-brown with a few white splashes, the sides of the valves with longitudinal splashes of greenish, the anterior valve nearly uniform greenish brown, the posterior valve mostly creamy white with a few splashes and a wedge-shaped patch of brown from the mucro to the girdle, which is irregularly numerous banded with pinkish brown.

Anterior valve fairly large, microscopically punctate, obsolete growth lines across valve, a couple of the characteristic concentric wrinkled ridges developing towards edge.

Median valves with the lateral areas elevated, showing half a dozen wrinkled ridges parallel to the girdle, the central areas smooth. (In some lights these ridges appear to overlap like tiles, hence the generic name).

Posterior valve with the apex elevated, median, the postmucronal slope concave, almost entirely smooth, a few wrinkles only beginning to appear: ante-mucronal area smooth.

Girdle very broad, with extremely small elongate oval closely imbricating scales, regularly striate with about ten striae.

Interior pale greenish white. Slitting 10—1—10-12.

Dimensions: 11 x 6 mm. juv.

Station: Under stones in pools on coral reef.

Habitat: Darnley Island, Torres Strait. Collected by E. H. Matthews.

Remarks: Though only one small specimen has yet been received it differs from the very large series from Lord Howe Island in its fewer concentric wrinkles and the concave postmucronal area.

Genus RHYSSOPLAX.

Rhyssoplax Thiele, Das Gebiss der Schnecken (Troschel), ii., 1893, 368.

Type by monotypy *R. janeirensis* = *Chiton affinis* Issel.

Clathropleura Thiele, Das Gebiss der Schnecken (Troschel) ii., 1893, 367.

Not *Clathropleura* Tiberi., 1877, of which the type is *C. laevis*. Cf. Iredale, Proc. Mal. Soc., xi., 1914, 39.

Anthochiton Thiele, Das Gebiss der Schnecken (Troschel) ii., 1893, 377.

Type by monotypy *Chiton tulipa* Quoy & Gaimard.

This genus comprises a large series of species of superficial similarity, though of varying sculpture.

The shells are of large to small size, elongate ovals, highly elevated, carinated, with scaly girdles. The sculpture varies from almost smooth, longitudinal sculpture always being present on the central areas, to strongly sculptured shells. Anterior valve always eight-slit, insertion plate short, teeth finely regularly pectinated: sutural laminae large, sinus broad, finely toothed, median valve with one slit at each side, finely pectinate: posterior valve with short insertion plate cut into about ten to twelve teeth, all being finely pectinate. Girdle scaly, scales striate but with a strong tendency to smoothness, sometimes small ovals, at others more rounded and larger, always closely imbricating.

As regards the sculpture, the juveniles of all the species are entirely smooth, the linear sculpture developing first on the pleural areas and then the radials on the lateral areas and end valves. This has been discussed by us in more detail in the Proc. Mal. Soc., xi., 1914, 39-41, and this Journal III., 1923, 163, and detailed figures are given on Plate xix., figs. 28-35 and 37 (*R. venusta*).

The species can easily be separated by means of the development of sculpture, thus:—

Anterior valve, lateral areas of median valves and postmucronal area smooth unsculptured:

Scales small, oval *orukta* series.

Scales large, suboval *jugosa* series.

Anterior valve, etc., weakly ribbed, ribs non-nodulose:

central areas weakly sculptured *calliozona*.

Anterior valve, etc., strongly ribbed, ribs non-nodulose,

central areas strongly sculptured *vauculensis*.

Anterior valve, etc., ribbed, ribs non-nodulose,

interstices pitted *bednalli* series.

Anterior valve, etc., ribbed, ribs nodulose,

central areas strongly sculptured *tricastalis* series.

i. Series of *R. orukta*.

The *orukta* series consists of two distinct species only, the typical *orukta* having a series of pits in front of the lateral area, the other species, *coxi*, having the pleural areas sculptured with a few weak sulcations only.

RHYSSOPLAX ORUKTA.

(Plate xviii., fig. 31. Plate xx., fig. 2.)

Chiton oruktus Maughan, Trans. Roy. Soc. S. Aust., xxiv., 1900, 89, pl. i., 3 a-g. McDonnell Bay, South Australia. Type in coll. Maughan.

Rhyssoplax oruktus May, Illus. Index Tas. Shells, 1923, pl. xvi., f. 10.

Shell medium, elongate oval, elevated, subearinated, sculpture of pits on pleural areas only, girdle scales small, weakly striate.

Colour variable. "Greyish green, mottled with olive. Anterior valve slightly lighter in colour than the rest. Dorsal areas tipped with reddish tinge." (Type). Upon a ground of buff or ivory white, most elaborate, varying colour patterns are arranged in olive-greens or shades of brown. The girdle is generally tessellated.

Anterior valve smooth.

Median valves with lateral areas elevated, smooth, growth lines sometimes notable: the pleural areas smooth save for a series of longitudinal pits in front of the lateral area, twelve in number.

Posterior valve with the mucro at anterior third, the postmucronal slope straight and steep, postmucronal area smooth, ante-mucronal area pitted as central area.

Girdle with small scales, faintly striate.

Interior greenish-white. Slitting 8—1—10.

Dimensions: 20 x 10 mm. (type); 26 x 13 mm. Tasmanian specimen figured.

Station: Under stones below low water mark.

Habitat: South Australia. Tasmania, Victoria.

Remarks: The South Tasmanian shells which Ernest Mawle found fairly numerous at Port Arthur are mostly dark coloured, more elevated and more elongate than typical shells, with more numerous pits.

RHYSSOPLAX COXI.

(Plate xviii., figs. 19, 32-34. Plate xx., fig. 3.)

Chiton coxi Pilsbry, Nautilus, vii., 1894, 119. Port Jackson, New South Wales. Type in Philad. Acad.

Chiton (Clathropleura) bellulus Thiele, Rev. Chitonon (Chun's Zoologica, Heft 56) Pt. ii., "1910" = Dec., 1909, 93, pl. x., f. 5-8. New South Wales. Type in Berlin Mus.

Chiton coxi Hedley & Hull, Rec. Aust. Mus., vii., 1909, 261, 262, pl. lxxiii., f. 3-5.

Shell small, elongate oval, elevated, semicarinated, sculpture of weak sulcations on pleural areas only, girdle scales, small ovals.

Colour extremely variable. "Delicate bluish, mottled or blotched with olive brown, yellow and white." (Type). While the prevailing colour is brown mottled with lighter, some examples are emerald green with one or two valves in purple; grey with several valves in scarlet. white with end valves in grey; or pale brown with several valves in black.

Anterior valve smooth.

Median valves with lateral areas elevated, smooth; pleural areas sculptured with a few longitudinal sulcations only: these vary in number in the same locality so the variation may be sexual.

Posterior valve with mucro median, postmucronal slope concave.

Girdle with small weakly striate closely imbricating oval scales; in many cases tessellated in contrasting colours.

Interior bluish or creamy white. Slitting 8—1—10-12.

Dimensions: 13 x 7.5 mm. (type); 21 x 12 (maximum).

Station: Under stones below low water mark.

Habitat: New South Wales, South Australia.

Remarks: Mr. E. H. Matthews collected a couple of specimens on smooth limestone rock, three feet below low water at Giles Point, S.A.

ii. Series of *R. jugosa*.

Key to the species:—

Anterior valve, lateral areas of median valves, and postmucronal area smooth:

Pleural sculpture weak *torriana*.
strong:

Few ribs crossing the valve *diaphora*.

All ribs crossing the valve *jugosa*.

RHYSSOPLAX TORRIANA.

(Plate xviii., figs. 18, 28-30, 35, 36. Plate xx., fig. 1.)

Chiton torriana Hedley & Hull, Rec. Aust. Mus., vii., Feb. 28, 1910, p. added (no pagination). New name for *C. torri*, id. Type in Aust. Mus.

Chiton torri Hedley & Hull, Rec. Aust. Mus., vii., 1909, 262, pl. lxxiii., f. 6-11. Kangaroo Island, South Australia. Not *Chiton torri* Suter, Proc. Mal. Soc., vii., 1907, 295.

Chiton hullianus Iredale, Proc. Mal. Soc., ix., June 30, 1910, 103. New name for *C. torri* Hedley & Hull.

Rhyssoplax torrianus var. *klemi* Ashby, Trans. Roy. Soc. S. Aust., xliii., 1919, 72, pl. xi., f. 3. Corney Point, Yorke Peninsula, South Australia. Type in coll. Ashby.

Shell large, oval, elevated, carinated, sculpture of weak sulcations on pleural areas only, girdle scales large.

Colour pale olive green with dark green concentric lines on both end valves and lateral areas of median valves; jugal area and edges of sulci in central areas deep green.

Anterior valve smooth.

Median valves with lateral areas smooth, elevated: the pleural areas sculptured with weak longitudinal sulci, these varying in number from 9-10 to 3-4.

Posterior valve with mucro ante-median, postmucronal slope nearly straight.
Girdle with large rounded oval scales, faintly striated.

Interior greenish white. Slitting 8—1—12.

Dimensions: 15 x 9 mm. (type); 44 x 25 mm. (maximum measured).

Station: Under stones below low water mark.

Habitat: South Australia, South Western Australia.

Remarks: The western shells appeared to show fewer sulcations on the pleural areas, but this is proven to be individual only as Ashby named this variety from South Australia.

RHYSSOPLAX DIAPHORA.

(Plate xviii., fig. 39. Plate xix., fig. 1.)

Rhyssoplax diaphora Iredale & May, Proc. Malac. Soc., xii., 1916, 115, pl. v., f.

1. Norfolk Bay, Tasmania. Type in Tasmanian Museum. May, Illus.

Index Tas. Shells, 1923, pl. xvi., f. 9.

Shell large, elongate oval, very elevated, carinate, sculpture of longitudinal ribs on pleural areas only, girdle scales large.

Colour pale olive green, end valves and lateral areas concentrically lined in dark green, a white triangle on the postmucronal slope; the ridges between the sulci of the central areas reddish-brown, the sulci blue; jugal area dark green.

Anterior valve smooth, very perpendicular; in senile shells a faint radial ribbing is suggested.

Median valves with the lateral areas well elevated, smooth, growth lines present in old shells when radials may be indistinctly seen: pleural areas with weak longitudinal ribs less than half of which extend across the valve. These vary in number from ten to sixteen, four to seven reaching across: jugal area wide, wedge-shaped.

Posterior valve with mucro postmedian, postmucronal slope slightly concave.

Girdle with large rounded oval scales, obsoletely striate.

Interior pale bluish green. Slitting 8—1—12.

Dimensions: 31 x 17 mm. (type); 46 x 24 mm. (maximum measured).

Station: Under stones below low water mark.

Habitat: Tasmania, Victoria (except on eastern coast), South Australia.

RHYSSOPLAX JUGOSA.

(Plate xviii., figs. 20, 37, 38. Plate xx., fig. 4.)

Chiton jugosus Gould, Proc. Bost. Soc. Nat. Hist., ii., 1846, 142. New South Wales. Type in Phil. Acad. U.S. Exped. Mol., 1852, 317. Atlas, pl. 28, f. 430.

Lophyrus jugosus Gould, Otia Conch., 1862, 3, 242.

Chiton concentricus Reeve, Conch. Icon., iv., 1847, Chiton, sp., 95, pl. xvi., f. 95. New Zealand (Earl), error = Port Jackson, New South Wales. Mus. Cuming in Brit. Mus. Not *C. concentricus* Koninek, 1843, Descr. Anim. foss., 322. Nor *C. concentricus* Sowerby, 1840.

Chiton jugosus Pilsbry, Man. Conch., xiv., 1893, 178, pl. 36, f. 91-95. Hedley & Hull, Rec. Aust. Mus., vii., 1909, 262, pl. lxiii., f. 12, 13.

Shell large, oval, elevated, carinate, sculpture of longitudinal ribs extending across the pleural areas, girdle scales large.

Colour: While in general terms this may be described as extremely variable, there is yet a consistent colour pattern from which few deviations are found. The anterior valve, the lateral areas of the median valves, and the greater part of the posterior valve are ornamented with coloured concentric lines, the postmucronal area of the posterior valve having an inverted V in white or with

rayed coloured lines parallel with the sides of the triangle. The ribs separating the sulci of the central areas are reddish-brown, while the sulci themselves are blue. The most frequent colour of the concentric line pattern is green, pale to dark olive, while it may be found wholly or partly in pink, red, orange, blue or black. The adoption of red for the whole or part of valves ii. and iii. is a common practice; and many specimens may be found with some or all of valves ii. to vii. in white. In most of these partial albinos traces of the concentric lines may be seen in faint grey, while the colouring of the central areas is constant, though faint. The most brilliant colouring is found amongst examples inhabiting sandstone country; basalt produces colder colouring, black and white contrasts being often found, while in granite and shale country the dull greens predominate.

Anterior valve smooth.

Median valves with the lateral areas well raised, smooth, growth lines rarely notable: pleural areas carved with straight square-cut ribs crossing the valves, ten to fourteen on each side, jugal area narrow, linear.

Posterior valve with mucro ante-median, postmucronal slope slightly concave. Girdle scales large, convex, obsoletely striated.

Interior pale bluish or greenish white. Slitting 8—1—12.

Dimensions: 35 x 20 mm. (type); 48 x 26 mm. (maximum measured—Two-fold Bay, N.S.W.).

Station: Under stones below low water mark.

Habitat: New South Wales, Eastern Victoria.

iii. RHYSSOPLAX CALLIOZONA.

(Plate xix., fig. 2. Plate xx., fig. 13.)

Chiton aereus var. *calliozona* Pilsbry, Nautilus, viii., 1894, 55. Gulf St. Vincent, South Australia. Type in Philad. Acad.

Lophyrus tulipa Angas, P.Z.S., 1865, 186. Port Lincoln, S.A. (error for *L. sicula*).

Chiton siculoides Angas, P.Z.S., 1878, 868. Nom. nud. Port Lincoln, S.A.

Chiton calliozona Bednall, Proc. Malac. Soc., ii., 1897, 151, f. in text and pl. xii., f. 6.

Rhyssoplax calliozoma (sic) May, Illus. Index Tas. Shells, 1923, pl. xvi., f. 8.

Shell very large, elongate oval, less elevated than majority of this genus, carinate.

Colour olive-green, darker on the lateral areas, lighter on the jugum; dark green vertical lines crossing the central areas. Girdle scales in alternate patches of claret and green.

Anterior valve with twenty flattened broad radial ribs, non-nodulose with narrow interstices, ribs increasing by intercalation with age.

Median valves with the lateral areas similarly sculptured with three or four radials with shallow undulations between: pleural areas with 2-12 weak sulci laterally, the jugal area broad and painted with lines parallel to and simulating these sulci. This sculpture becomes distinctly weaker with age; the sulci vary considerably, about two or three on each side in juveniles to twelve in adults.

Posterior valve with mucro submedian, postmucronal slope concave, postmucronal area obsoletely rayed as anterior valve.

Girdle scales large, very convex, very faintly striate.

Interior pale bluish. Slitting 8—1—10.

Dimensions: 38 x 18 mm. (type); 55 x 33 mm.

Station: At edge of smooth stones, imbedded in clean sand two to three feet below low water (E.H.M.).

Habitat: South Australia, Northern Tasmania, Victoria.

iv. RHYSSOPLAX VAUCLUSENSIS.

(Plate xix., figs. 8-12, 39. Plate xx., figs. 7, 12.)

Chiton vauclusensis Hedley & Hull, Rec. Aust. Mus., vii., 1909, 261, pl. lxxiv., f. 19-23. Vaucluse, Port Jackson, N.S.W. Type in Aust. Mus.

Rhyssoplax vauclusensis Hull, Aust. Zool., iii., 1923, 162, pl. xxv., f. 9-12.

Shell large, elongate oval, elevated, carinate, sides slopes slightly curved and steep.

Colour olive-buff, flamed with sepia in the pleural areas, the jugal area with sepia dots; most ribs picked out with orange or chocolate; rarely cream or ivory white with a few sepia dots on the posterior margins of the valves.

Anterior valve rayed with 20-28 ribs, not distinctly nodulose, interstices narrow but not pitted, number of ribs increasing with age by intercalation.

Median valves with laterals similarly sculptured with three or four ribs, more according to age: the central areas longitudinally strongly ribbed throughout, the jugal area very narrow and linear, the ribs about sixteen on each side, the number varying with age, the interstices square-cut.

Posterior valve with mucro slightly antemedian, the postmucronal slope concave, the postmucronal area rayed as anterior valve, but sculpture less pronounced: antemucronal area as central areas.

Girdle scales large, convex obsoletely striate.

Interior pale bluish green. Slitting 8-1-12.

Dimensions: 33 x 20 mm. (type); 44.5 x 25 mm. (maximum measured).

Station: On under or upper side of stones in 4-5 feet below low water mark.

Habitat: New South Wales (Shellharbour, Port Jackson, Port Stephens), Southern Queensland (Caloundra, Point Cartwright).

Remarks: Of this handsome and strongly sculptured shell only three examples were known between 1909 and 1921. In the latter year several were taken at the type locality, Bottle and Glass Rocks, Vaucluse, Port Jackson, and subsequently a considerable number were collected at Shellharbour by McAndrew, and Thackway at Port Stephens. Iredale took one at Caloundra, Queensland, in 1909, and Hull took several at the same place and at Point Cartwright, further north, in 1921-3. The Queensland shells are rather coarser in sculpture, and several juveniles were taken, showing the entire absence of sculpture on the lateral areas.

iv. Series of *R. bednalli*.

Radial sculpture strong; colouration green:

Twelve ribs on pleural area *bednalli*.

Ten ribs on pleural area *surrecta*.

Radial sculpture weak; colouration red *exoptanda*.

RHYSSOPLAX BEDNALLI.

(Plate xix., figs. 7, 18-21. Plate xx., fig. 6.)

Chiton bednalli Pilsbry, Nautilus, ix., 1895, 90. Yorke's Peninsula, South Australia. Type in coll. Bednall, now Matthews. Bednall, Proc. Mal. Soc., ii., 1897, 153, pl. xii., f. 8, and f. in text.

Rhyssoplax bednalli Hull, Aust. Zool., ii., 1922, 84, pl. xxiv., B., f. 5-8.

Shell large, elongate oval, strongly elevated, carinate, side slopes straight.

Colour cream white, with a small flesh pink spot at each beak, and a sparse mottling of same on lateral areas, the central areas clouded with green, the girdle flesh tinted with green bars.

Anterior valve with about twenty radial flattened ribs, the interstices narrow and pitted: the apex smooth.

Median valves with lateral areas elevated, similarly sculptured, the radial ribs three or four in number, the posterior seminodulose, their interstices pitted: the central areas sculptured with narrow longitudinal ribs extending across the valve, about twelve on each side, the jugal area narrow, smooth, linear.

Posterior valve with muero submedian, the postmucronal slope very concave, the postmucronal area sculptured as anterior valve but sculpture weaker: ante-mucronal area as central areas.

Girdle with large convex rounded faintly striate scales.

Interior bluish white, darker medially. Slitting 8—1—10.

Dimensions: 25 x 11 mm. (type).

Station: On small smooth stones in 18 inches at low water (E.H.M.).

Habitat: South Australia, Victoria.

RHYSSOPLAX SURRECTA.

(Plate xix., figs. 23-26. Plate xx., fig. 5.)

Rhyssoplax surrecta Hull, Aust. Zool., ii., 1922, 84, pl. xxiv., B., f. 1-4. Port Willunga, South Australia. Type in South Australian Museum.

Shell large, elongate oval, very elevated, carinated.

Colour white, flecked with pale reddish-brown on the lateral areas and beaks of median valves: central areas washed with pale green, flecks of the same colour appearing on the jugal tract.

Anterior valve with about twenty-six radial ribs, the interstices pitted, valve rather perpendicular.

Median valves with lateral areas radially ribbed, ribs few and flattened, interstices pitted, the posterior edge toothed but the rib not distinctly noduled: the pleural areas on each side crossed by ten bold longitudinal ribs, the jugal area narrow, linear.

Posterior valve with muero submedian, postmucronal slope very concave, postmucronal area rayed as anterior valve but sculpture less pronounced: ante-mucronal area as central areas.

Girdle scales large, convex, apically striate.

Interior pale greenish white. Slitting 8—1—12.

Dimensions: 35 x 12 mm. (type).

Station: Probably deep water.

Habitat: South Australia.

Remarks: This species appears to be a deeper water representative of *R. bednalli*, growing to a larger size, with bolder sculpture throughout.

RHYSSOPLAX EXOPTANDA.

(Plate xix., fig. 3. Plate xx., fig. 14.)

Chiton exoptandus Bednall, Proc. Malac. Soc., ii., 1897, 152, f. in text and pl. xii., f. 7. Gulf St. Vincent, South Australia (dredged). Type in coll. Bednall, now Matthews.

Shell large, elongate oval, elevated, carinate, side slopes straight.

Colour distinctive, reddish or pale vermilion, with concentric lines in darker on end valves and lateral areas of median valves; sometimes with wedge-shaped markings in deep red on the jugum, or irregularly at sides, vertically waved across lateral and pleural areas.

Anterior valve with about twenty flattened non-nodulose ribs, the interstices narrow and regularly pitted.

Median valves with lateral areas well elevated, sculptured as anterior valve, radials numbering two to four, evanescing towards edge. Pleural areas crossed by about eight bold well separated longitudinal ribs, succeeded by half a dozen

decreasing in size and more closely spaced, thus forming a wedge-shaped smooth jugal area.

Posterior valve with the mucro postmedian, postmucronal slope concave, postmucronal area rayed as anterior valve but radials narrower and more closely packed: ante-mucronal area as central areas.

Girdle scales large, convex, very faintly apically striate.

Interior pinkish white. Slitting 8—1—12.

Dimensions: 27.28 x 14.15 mm. (type); up to 60 mm. (E.H.M.).

Station: Upper surface of smooth stones in sandy pools, two-three feet below low water (E.H.M.). Dredged in shallow water.

Habitat: South Australia, Victoria.

v. Series of *R. tricostalis*.

Characterised by bold nodulose radial sculpture and well developed longitudinal ribbing, girdle scales oval, striate, medium to small, not mucronate.

Scales strongly striate: longitudinal sculpture bold *tricostalis*.

very faintly striate: longitudinal sculpture weak *geraldtonensis*.

strong *venusta*.

Very bold sculpture: longitudinal and radial *excellens*.

RHYSSOPLAX TRICOSTALIS.

(Plate xix., fig. 5. Plate xx., figs. 9, 10.

Chiton (canaliculatus var. ?) *tricostalis* Pilsbry, Nautilus, viii., 1894, 54. Gulf St. Vincent, South Australia. Type in Philad. Acad.

Chiton limans Sykes, Proc. Mal. Soc., ii., 1896, 93, *vide* Ashby, Trans. Roy. Soc. Vict., 1920, 153.

Chiton tricostalis Bednall, Proc. Mal. Soc., ii., 1897, 151.

Chiton aureomaculatus Bednall & Matthews, Proc. Mal. Soc., vii., 1906, 91, pl. ix., f. 3 a-f. Marion Reef, Troubridge Shoal, South Australia. Type lost.

Rhyssoplax tricostalis Ashby, Proc. Roy. Soc. Vict., xxxiii., 1921, 154, pl. viii., f. 2. May, Illus. Index Tas. Shells, 1923, pl. xvi., f. 11.

Shell medium, elongate oval, very elevated, carinate, side slopes straight.

Colour very variable. Wholly red, brown, olive-green or purple; frequently with valves ii. and iii. white; girdle generally tessellated.

Anterior valve with strongly nodulose radial ribs, the ribs varying in number and the nodules in strength: the type was described as having 17-19 ribs.

Median valves with lateral areas similarly ribbed, ribs varying from two to five, and size of tubercles varying, central areas with narrow jugal smooth area, about fifteen longitudinal ribs on each side, all but one or two extending across the valve.

Posterior valve with mucro submedian, postmucronal slope concave, postmucronal area sculptured as anterior valve but weaker: ante-mucronal area as central areas.

Girdle scales small, elongate ovals, closely imbricating, striate.

Interior bluish white. Slitting 8—1—12.

Dimensions: 17 x 9 mm. (type); 30 x 15 mm.

Station: Under stones below low water mark.

Habitat: South Australia, Victoria, Northern Tasmania.

Remarks: The variation seen in the sculpture of this species in the juvenile stages is obliterated in senile shells. Thus a shell measuring 18 mm. may show radials of few large broad nodules, very like those seen in *verconis*, eleven on the anterior valve, two on the lateral areas and about eleven on the postmucronal area, seven nodules to a radial: another shell collected at the same time and place,

and very little larger, only 21 mm. in length, will show eighteen radials with others intercalating on the anterior valve, the nodules bolder, more rounded and ten in a row, the lateral similarly with three rows: in each case the pleural area shows about eleven distinct ridges on each side.

A larger shell will show twenty strongly nodulose ribs on the anterior valve, four and five on the lateral areas and fifteen on the postmucronal area: the longitudinal ribs on the pleura number 12-13 on each side, all reaching across and leaving a narrow smooth linear jugum.

RHYSSOPLAX GERALDTONENSIS.

(Plate xix., fig. 4.)

Rhyssoplax geraldtonensis Ashby, Trans. Roy. Soc. S. Aust., xlv., 1921, 47, pl. viii., f. 1. Geraldton, Western Australia. Type in coll. Ashby.

Shell medium, elongately oval, strongly elevated, carinated. Colour dull cream, specked throughout with golden brown, on valves iii., iv., and v. a longitudinal patch of bright red-brown is seen extending from the girdle half way across each side of the valve; small patches of brown occur on the posterior valve.

Anterior valve obscurely radially ribbed with nodules, about sixteen rays, nodules only discernible in a good light; the posterior edge of the valve semi-toothed; apical portion smooth, twice as extensive as in *R. tricastalis*.

Median valves with the lateral areas rayed with ribs which number three or four, scarcely nodulose, the posterior one more marked; the pleural areas are longitudinally ridged with about a dozen weak ridges only, eight of which cross the valves, leaving a large wedge-shaped smooth jugal area.

Posterior valve with mucro median, postmucronal slope straight; postmucronal area rayed with a dozen semi-nodulose ribs; ante-mucronal area as central area.

Girdle scales small, very faintly striate apically.

Interior white. Slitting normal.

Dimensions: 26 x 14 mm. 20 x 11 mm (type).

Station: Under stones below low water mark.

Habitat: Western Australia.

Remarks: The shell described and figured was collected by Hull at Rabbit Island, King George Sound, W.A., and was examined by Ashby, who identified it.

RHYSSOPLAX VENUSTA.

(Plate xix., figs. 28-35, 37.)

Rhyssoplax venusta Hull, Aust. Zool., iii., 1923, 165, pl. xxii., f. 1-4. 9-12. Emu

Rhyssoplax particolor Hull, Proc. Roy. Soc. Queensland, xxxvi., 1924, 114.

Park, Keppel Bay, Queensland. Type in Australian Museum.

Shell small, elevated, oval, carinate, side slopes curved, sculpture of nodulose radials, and longitudinal ribs on pleural areas.

Colour apple-green, except valves iv. and v., which are pompeian red; the girdle yellow, except opposite valves iv. and v., where it is brick-red and there are a few irregular splashes of brick-red appearing on the yellow portion. (Type). Other examples are wholly brown, olive-green, dull red, and combinations of these colours with one or more valves in black.

Anterior valve with the early portion smooth, then twelve radial ribs of rounded separated nodules appear, increasing with age.

Median valves with lateral areas bounded by two semi-nodulose ribs, about six nodules to a rib, the interval between depressed, smooth: pleural areas with nine straight ridges on each side, interstices narrow, jugal area narrow, linear.

Posterior valve with mucro median, postmucronal slope nearly straight, post-mucronal area rayed as anterior valve, ribbing weaker, ante-mucronal area as central areas.

Girdle broad, scales small, elongate ovals, striate.

Interior bluish white. Slitting 8—1—11.

Dimensions: $8\frac{1}{2} \times 5$ mm. (juv.); 12×7 mm.; 17×10 mm.

Station: Under stones below low water mark. Occasionally found on dead coral or on *Pinna*.

Habitat: North Queensland (Keppel Bay to Thursday Island).

Remarks: As remarked upon when described the type was immature, and the development shows a well sculptured shell with twenty-five nodulose radial ribs on the anterior valve; four nodulose ribs on the lateral areas, sixteen on the postmucronal area: the pleural area has sixteen ridges on each side. Such a shell measures 17.5×9.5 mm. from Armit I.

A variant from Thursday Island shows little bold sculpture, though reaching a length of 17×10 mm.

RHYSSOPLAX EXCELLENS, n.sp.

(Plate xix., figs. 22, 27, 40.)

Chiton pulcherrimus Brazier, Proc. Linn. Soc. N.S.W., ii., 1877, 75. Darnley Island, Torres Strait. Type in Macleay Mus., Sydney. Not *C. pulcherrimus* Sowerby, P.Z.S., 1841, 103, from Island of Bohol, Philippine Group, in Mus. Cuming.

Shell medium, elongately oval, elevated, carinate, sculpture very complex, girdle scales large ovals, deeply grooved.

Colour creamy brown, the girdle with darker banding.

Anterior valve with about twenty-five radiating strongly nodulose ridges, the posterior edges apparently toothed.

Median valves with lateral areas very elevated, with three bold nodulose ridges, the diagonal showing an additional weaker nodulose rib anteriorly, while along the posterior edge a toothed rib is developed: pleural areas strongly longitudinally ridged with fourteen ridges on each side, a very narrow smooth jugal band being left: transverse ridges link up these longitudinals which are sharply nodulose.

Posterior valve with mucro median, postmucronal area concave, sculptured with twenty radiating nodulose ridges, ante-mucronal area sculptured as pleural areas.

Girdle wide with large oval scales bearing deep grooves, about six grooves to a scale.

Interior white. Slitting 8—1—12, all teeth regularly pectinated.

Dimensions: 22×13.5 mm.

Station: ?

Habitat: Darnley Island, Torres Straits (Brazier, "Chevert" Exped.).

Remarks: This is probably the most beautiful species of *Rhyssoplax*, certainly with most complicated sculpture. Pilsbry (Man. Conch., Vol. xiv., p. 130, 1893) only cognizant of the Philippine species from Carpenter's MS. notes included it in *Ischnochiton*, the teeth being only faintly pectinated and the girdle scales weakly striated. Iredale compared the Darnley Island shell with the type tablet and noted that, though the Philippine Islands' shells undoubtedly were of the *Rhyssoplacidae* series, the dorsal area was sculptured like honeycomb and the pleural sculpture differed a little in detail: the Queensland shell differed in the strong pectination of the insertion teeth and the deep grooving of the girdle scales.

Genus *MUCROSQUAMA*, n. gen.Type *Chiton carnosus* Angas.

This group shows the most remarkable development of the groups allied to *Rhyssoplax*, providing a heavily sculptured shell with a girdle covering of striated scales lengthening into semi-pyramidal structures. Three species are admitted, and it may be that two have developed independently, as one is found in deep water in the Adelaidean region, while two occur in the Peronian region. They are easily separated by means of the external sculpture:—

Anterior radials numerous, finely nodulose *particolor*.
 few, scarcely nodulose *carnosa*.
 few, composed of distant, broad nodules *verconis*.

MUCROSQUAMA CARNOSA.

(Plate xix., figs. 17, 36. Plate xx., fig. 11.)

Chiton carnosus Angas, P.Z.S., 1867, 222, ex Carpenter M.S. in synonymy of
Chiton muricatus A. Adams. Port Jackson, N.S.W. Type in Brit. Mus.

Chiton limans id., ib.

Chiton muricatus A. Adams, P.Z.S., 1852, 91, pl. xvi., f. 6. Sydney, N.S.W.
 Type in Brit. Mus. Not *C. muricatus* Tilesius, Mem. Acad. Sci. St. Petersburg,
 1824, 483.

Chiton limans Pilsbry, Man. Conch., xiv., 1892, 176. Ex Carpenter M.S. descrip-
 tion. Port Jackson, N.S.W. Type in Brit. Mus.

Chiton aurantius id., ib.

Chiton carnosus id., ib.

Chiton limans Sykes, Proc. Mal. Soc., ii., 1896, 93. New name for *Chiton muri-*
catus A. Adams. Sydney.

Rhyssoplax jacksonensis Ashby, Proc. Roy. Soc. Vic., xxxiii., 1921, 153, pl. viii.,
 f. 1 a, b. Port Jackson, N.S.W. Type in coll. Ashby.

Rhyssoplax carnosus Hull, Aust. Zool., iii., 1923, 164.

Shell medium, oval, elevated, carinate. Colour very variable. Generally brown or olive-green, frequently red, orange, vermilion, yellow or purple, or a combination of two or more of these colours; valve ii. often white or with a white line along the anterior margin.

Anterior valve very elevated, apex erect, sculptured with sixteen faintly nodulose ridges with deep wide interstices.

Median valves with lateral areas well raised with two main ridges, a couple intercalating, obscurely nodulose; interstices smooth; pleural areas with fifteen narrow parallel ridges on each side; small triangular smooth jugal area.

Posterior valve with mucro ante-median; postmucronal slope a little concave; postmucronal area with about sixteen semi-nodulose ribs; ante-mucronal area as central areas.

Girdle covered with closely imbricating striate scales which develop attenuate points with age, more prominent medially.

Interior pinkish-white, darker in middle. Slitting 8—1—12.

Dimensions: 30 x 18 mm. (Shellharbour, figured).

Station: Under stones below low water mark.

Habitat: New South Wales.

MUCROSQUAMA PARTICOLOR.

(Plate xix., figs. 13-16, 38.)

Rhyssoplax particolor Hull, Aust. Zool., iii., 1923, 165, pl. xxvi., f. 5-8. Caloundra, Queensland. Type in Australian Museum.

Shell small, recalling a small *carnosa* but differing slightly in the sculpture of the median areas, notable in that of the anterior valve and lateral areas, less pronounced in the postmucronal area: girdle scales pointed, not so mucronate.

Colour variable. Lilac-rose, mottled with darker; some median valves partly yellowish; the girdle lilac-rose, with four yellow bands in opposing pairs at the sutures of the anterior and posterior valves respectively (type). Other examples are olive-green with white stripe on valve ii., brown and white mottled. Yellow with valves iii. to v. black, and many other variants.

Anterior valve with about twenty-five seminodulose radials reaching little more than half the distance from the girdle to the apex, the apical portion unsculptured.

Median valves with the lateral areas similarly sculptured, two to four radials: pleural areas show about a dozen longitudinal ridges, of which eight cross the valve, jugal area smooth, wedge-shaped.

Posterior valve with mucro median, postmucronal slope a little concave, postmucronal area rayed as anterior valve: ante-mucronal area as central areas.

Girdle scales pointed, larger in the middle, where they become mucronate, but not with such apical points as in *carnosa*.

Interior pinkish white. Slitting 8—1—12.

Dimensions: 13 x 7 mm. (type); 20 x 11 mm. (figured shell).

Station: Under stones below low water mark.

Habitat: South Queensland.

MUCROSQUAMA VERCONIS.

(Plate xix., fig. 6. Plate xx., fig. 8.)

Chiton verconis Torr & Ashby, Trans. Roy. Soc. S. Aust., xxii., 1898, 215, pl. vi., f. 1. Gulf St. Vincent, South Australia (dredged). Type in coll. Torr. Shell medium, oval, elevated, carinate.

Colour pink, splashed and blotched with cream and a few small patches of brown.

Anterior valve with ten radial rows of separated broad nodules, six nodules to a row, thus forming six concentric rows, apex smooth.

Median valve with the lateral areas formed by two similar elevated rows, narrow depression between, and again six nodules to a row: pleural areas sculptured with about a dozen slanting fine ridges, on each side, the jugal area smooth, narrow linear.

Posterior valve with mucro ante-median, postmucronal slope concave; postmucronal area as anterior valve, but nodules smaller and more closely packed; ante-mucronal area as central areas.

Girdle scales small, mucronate, strongly striate.

Interior pinkish white. Slitting 8—1—12.

Dimensions: 24 x 12 mm. (type).

Station: Dredged.

Habitat: South Australia.

EXPLANATION OF PLATES.

Plate xviii.

- Fig. 1. *Poneroplax costata* Blainville, whole shell.
 2. *Poneroplax albida* Blainville, whole shell.
 3. *Poneroplax paeteliana* Thiele, whole shell.
 4. *Poneroplax paeteliana* Thiele, anterior valve.
 5. *Poneroplax paeteliana* Thiele, median valve.
 6. *Poneroplax paeteliana* Thiele, posterior valve.
 7. *Poneroplax paeteliana* Thiele, interior of posterior valve.
 8. *Poneroplax albida* Blainville, half median valve.
 9. *Poneroplax costata* Blainville, half median valve.
 10. *Poneroplax costata* Blainville, anterior valve.
 11. *Poneroplax albida* Blainville, anterior valve.
 12. *Poneroplax paeteliana* Thiele, half median valve.
 13. *Aerilamma primordia* Hull, whole shell.
 14. *Aerilamma primordia* Hull, anterior valve.
 15. *Aerilamma primordia* Hull, half median valve.
 16. *Aerilamma primordia* Hull, posterior valve.
 17. *Aerilamma primordia* Hull, interior of posterior valve.
 18. *Rhyssoplax torriana* Hedley & Hull, posterior valve from side.
 19. *Rhyssoplax coxi* Pilsbry, posterior valve from side.
 20. *Rhyssoplax jugosa* Gould, posterior valve from side.
 21. *Delicatoplax translucens* Hedley & Hull, whole shell.
 22. *Delicatoplax translucens* Hedley & Hull, interior of anterior valve.
 23. *Delicatoplax translucens* Hedley & Hull, half median valve.
 24. *Delicatoplax translucens* Hedley & Hull, interior of posterior valve.
 25. *Delicatoplax translucens*, Hedley & Hull, scales of girdle.
 26. *Tegulaplax matthewsi* Iredale & Hull, whole shell.
 27. *Tegulaplax matthewsi* Iredale & Hull, scales of girdle.
 28. *Rhyssoplax torriana* Hedley & Hull, interior of anterior valve.
 29. *Rhyssoplax torriana* Hedley & Hull, interior of half median valve.
 30. *Rhyssoplax torriana* Hedley & Hull, interior of posterior valve.
 31. *Rhyssoplax orukta* Maughan, whole shell.
 32. *Rhyssoplax coxi* Pilsbry, whole shell.
 33. *Rhyssoplax coxi* Pilsbry, scales of girdle.
 34. *Rhyssoplax coxi* Pilsbry, half median valve.
 35. *Rhyssoplax torriana* Hedley & Hull, whole shell.
 36. *Rhyssoplax torriana* Hedley & Hull, half median valve.
 37. *Rhyssoplax jugosa* Gould, scales of girdle.
 38. *Rhyssoplax jugosa* Gould, half median valve.
 39. *Rhyssoplax diaphora* Iredale & May, half median valve.

Plate xix.

- Fig. 1. *Rhyssoplax diaphora* Iredale & Hull, whole shell.
 2. *Rhyssoplax calliozona* Pilsbry, half median valve.
 3. *Rhyssoplax exoptanda* Bednall, half median valve.
 4. *Rhyssoplax geraldtonensis* Ashby, whole shell.
 5. *Rhyssoplax tricostalis* Pilsbry, half median valve.
 6. *Mucrosquama verconis* Torr & Ashby, half median valve.
 7. *Rhyssoplax bednalli* Pilsbry, whole shell.
 8. *Rhyssoplax vauchlusensis* Hedley & Hull, whole shell.
 9. *Rhyssoplax vauchlusensis* Hedley & Hull, anterior valve, immature.
 10. *Rhyssoplax vauchlusensis* Hedley & Hull, half median valve, immature.

11. *Rhyssoplax vauchlusensis* Hedley & Hull, posterior valve, immature.
12. *Rhyssoplax vauchlusensis* Hedley & Hull, scales of girdle.
13. *Mucrosquama particolor* Hull, anterior valve, immature.
14. *Mucrosquama particolor* Hull, half median valve, immature.
15. *Mucrosquama particolor* Hull, posterior valve, immature.
16. *Mucrosquama particolor* Hull, scales of girdle.
17. *Mucrosquama carnosa* Angas, scales of girdle.
18. *Rhyssoplax bednalli* Pilsbry, scales of girdle.
19. *Rhyssoplax bednalli* Pilsbry, anterior valve.
20. *Rhyssoplax bednalli* Pilsbry, half median valve.
21. *Rhyssoplax bednalli* Pilsbry, posterior valve.
22. *Rhyssoplax excellens* Iredale & Hull, scales of girdle.
23. *Rhyssoplax surrecta* Hull, scales of girdle.
24. *Rhyssoplax surrecta* Hull, anterior valve.
25. *Rhyssoplax surrecta* Hull, half median valve.
26. *Rhyssoplax surrecta* Hull, posterior valve.
27. *Rhyssoplax excellens* Iredale & Hull, whole shell.
28. *Rhyssoplax venusta* Hull, anterior valve, immature.
29. *Rhyssoplax venusta* Hull, half median valve, immature.
30. *Rhyssoplax venusta* Hull, posterior valve, immature.
31. *Rhyssoplax venusta* Hull, scales of girdle.
32. *Rhyssoplax venusta* Hull, anterior valve of juvenile.
33. *Rhyssoplax venusta* Hull, half median valve of juvenile.
34. *Rhyssoplax venusta* Hull, posterior valve of juvenile.
35. *Rhyssoplax venusta* Hull, scales of girdle of juvenile.
36. *Mucrosquama carnosa* Angas, whole shell.
37. *Rhyssoplax venusta* Hull, whole shell, adult.
38. *Mucrosquama particolor* Hull, whole shell, adult.
39. *Rhyssoplax vauchlusensis* Hedley & Hull, half median valve, adult.
40. *Rhyssoplax excellens* Iredale & Hull, half median valve.

Plate xx.

- Fig. 1. *Rhyssoplax torriana* Hedley & Hull.
 2. *Rhyssoplax orukta* Maughan.
 3. *Rhyssoplax coxi* Pilsbry.
 4. *Rhyssoplax jugosa* Gould.
 5. *Rhyssoplax surrecta* Hull.
 6. *Rhyssoplax bednalli* Pilsbry.
 7. *Rhyssoplax vauchlusensis* Hedley and Hull (type).
 8. *Mucrosquama verconis* Torr & Ashby.
 9. *Rhyssoplax tricostalis* Pilsbry (var. *aureomaculata*).
 10. *Rhyssoplax tricostalis* Pilsbry.
 11. *Mucrosquama carnosa* Angas.
 12. *Rhyssoplax vauchlusensis* Hedley & Hull (juvenile of Queensland form).
 13. *Rhyssoplax calliozona* Pilsbry.
 14. *Rhyssoplax exoptanda* Bednall.
 15. *Delicatoplax translucens* Hedley & Hull.

THE CUTTLE-FISH "BONES" OF THE SYDNEY BEACHES.

(PHYLUM MOLLUSCA—CLASS CEPHALOPODA).

By TOM IREDALE.

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(Plates xxi.-xxiii.).



Fig. 5. Front view of *Solitosepia plangon*, waiting for its prey.

No molluscan "shells" represented in the Sydney Fauna appear to have been so neglected as the present group. A common object on every beach all through the year, no attempt at classifying the various forms has hitherto been made. This is mainly due to the fact that the complex makers of the "bones" have been regarded as difficult to study, and the "bone" itself has been considered a secondary matter of little importance, which has thus escaped serious attention. The "bones" are at times abundant on the Sydney beaches, and some specimens may be picked up at any time: it would appear that these beaches constitute one of the richest hunting grounds in the world. So many different forms have been investigated that a novel treatment is here suggested: this was necessitated by a study of the literature of the subject, and a survey of the species from the rest of Australia. Consequently, while this essay fulfils the primary scope of the inquiry, the corollary is a survey of the cuttle fishes of Australia, which will be later published. In the fuller account the animals, as well as the bones will be dealt with in detail, and the technicalities, which have developed, comprehensively demonstrated.

I will here simply provide a summary of the "bones" that may be picked

up on these beaches, but which constitute the known faunula of this State. The Sydney beaches include all the beaches between Broken Bay and Botany Bay, and all the species have been found on these, but as hereafter shown some species are much commoner in the north, while others are better represented in the south of the State. In this inquiry I have been assisted by many friends, all of whom are sincerely thanked, and for especial thanks I may signal out Mr. A. F. Basset Hull, who has collected for me many specimens from Queensland and New Caledonia, Mr. G. MacAndrew, who made very large collections at Shell Harbour, Mr. H. Mort, who searched Jervis Bay, Mr. A. O'Sullivan, who gathered a fine lot at the Richmond River rocks, and Mr. G. P. Whitley, of the Australian Museum, who has searched the beaches south of the Sydney Heads, while I have patrolled those to the north. Altogether some thousands of specimens have been critically examined from this State alone, so that a reliable working basis can be safely provided.

The history of the group in Sydney literature is somewhat brief. As long ago as 1849, cataloguing the mollusca in the British Museum, Gray included two species from Sydney, one of which he named as a new species. Later, when Angas listed the Mollusca of Port Jackson in 1867, 1871, 1877, his only note reads, "Species of *Sepia*, etc., occur on the coast of New South Wales, but at present they appear to be unidentified." Dealing with the material collected by the "Challenger," Hoyle introduced a new species from deep water off Twofold Bay, N.S.W., and figured one of Gray's previously described species. When Whitelegge catalogued the Invertebrate Fauna of Port Jackson and neighbourhood in 1889 four species were listed, while Brazier in 1892 collated five from New South Wales, but only four from Port Jackson. Hedley, in 1908, added another species, and in 1918 recorded five species only. The present account registers fourteen species, of which eight may be regarded as common.

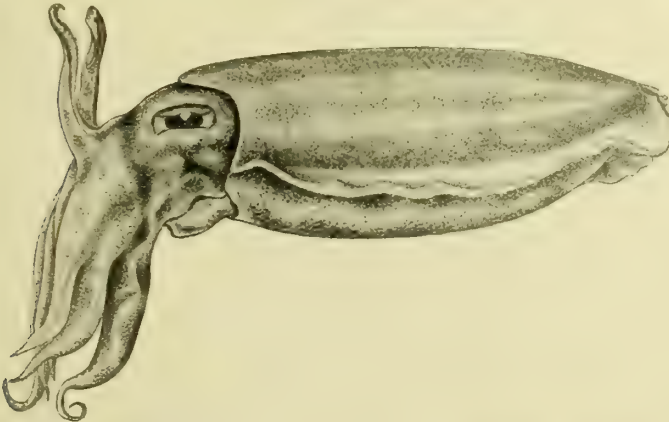


Fig. 6. Side view of *Solitosepia plangon* in swimming attitude, waiting for its prey. Long tentacles concealed.

The animal which is responsible for these "bones" is a Cephalopod—with eight arms and two longer tentacles—which swims only. Externally these animals are comparatively generalised, so that hitherto little has been done in connection with the determination of their interrelationships, but from study of the bones I suggest inquiry would indicate valid differences equivalent to the obvious

ones seen in related families. I have examined animals of half of the species represented in the Australian fauna, and propose to describe them in my larger essay, so here only give a couple of illustrations so that if an animal be met with it may be recognised and the bone will absolutely determine the species.

The "bones" are so numerous that the majority are recognisable at sight when the distinguishing characters are known. A crude method of tabulating them by means of sizes may be mentioned as there is one extremely large one, two or three rarer large forms, the majority of medium size and a couple of very small narrow ones.

An artificial key can be arranged on other features as:—

Inner cone large, shell medium, spine keeled	<i>Solitosepia</i> .
spine not keeled	<i>Mesembrisepia</i> .
Inner cone missing, shell medium, spine keeled	<i>Glyptosepia</i> .
spine rounded	<i>Decorisepia</i> .
shell very small and narrow, spine rounded	<i>Arctosepia</i> .
Inner cone produced as a glaze and spine missing in adult	<i>Amplisepia</i> .
Inner cone produced ventrally as a ledge	<i>Acanthosepion</i> .

Genus SOLITOSEPIA, nov.

Shell of medium size, the inner cone well developed, the spine keeled. While these features distinguish this group the members disagree in other details so much that the species may not prove congeneric later. The species selected as type, *S. liliana*, is the broadest one, while *S. plangon*, in addition to being the narrowest, shows reduction of the inner cone. This group is characteristic of the Peronian region as though four species are here included, two are at present only known from that region, and the other two have not a wide extralimital range.

An artificial key may be presented thus:—

Shell broad, back not ribbed	<i>S. liliana</i> .
medium, back not ribbed	<i>S. mestus</i> .
larger, back ribbed	<i>S. rozella</i> .
smaller and narrow, back ribbed	<i>S. plangon</i> .

As confirmatory characters, the back of the firstnamed is chalky-white, while that of the second is cream: neither show a median ventral sulcus. The third has a very deep ventral sulcus and a prominent rose inner cone. The last is narrow, a long deep ventral sulcus, and inner cone more or less obsolete.

SOLITOSEPIA LILIANA, n.sp.

Plate xxi., fig. 1-3.

Shell of medium size, regularly oval, about twice as long as broad, a short prominent spine produced backwards and bearing a keel ventrally: dorsal surface not ribbed, nor ventral surface anteriorly swollen, nor sulcate.

Dorsal surface wholly calcareous, bluish or chalky-white in colour, finely irregularly pustulose, the pustules becoming coarse on each side towards the spine, while a series of indistinct rays may be seen radiating from the spine anteriorly.

Ventral surface flattened anteriorly, excavate posteriorly, a chitinous edge along the anterior half, but obsolete posteriorly: the anterior ventral surface does not show striation, though posteriorly it is strongly striate, the striae very close, but square-cut, not produced to a point.

Inner cone large, white.

Dimensions: 90 x 45 mm. Average. Type: 114 x 51 mm. Manly Beach.

Habitat: New South Wales.

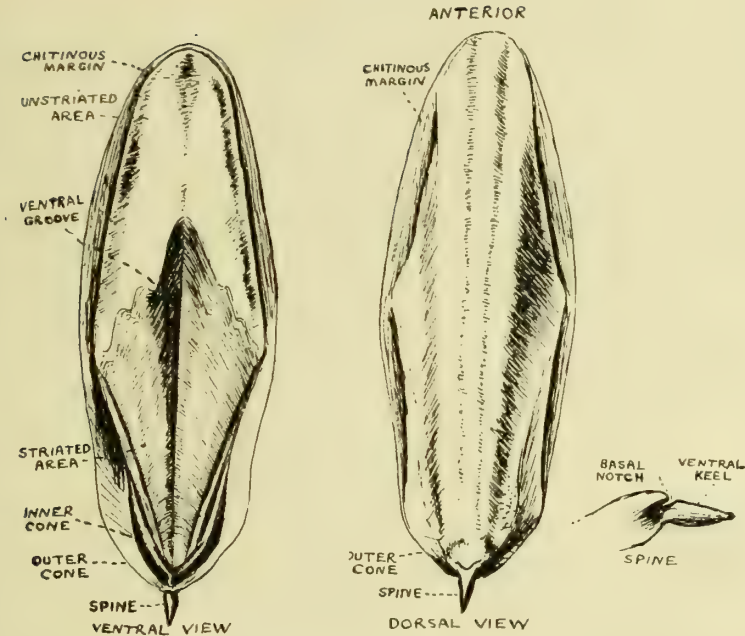


Fig. 7. Diagram of Cuttle-Fish Bone, illustrating terms used in description.

SOLITOSEPIA MESTUS.

Plate xxi., figs. 4-5.

1849. *Sepia mestus* Gray, Cat. Moll. Coll'n Brit. Mus. Cephal., p. 108. Australia.
 1886. Hoyle, Rep. Zool. Chall., Vol. xvi., p. 135, figs. in text.
 1892. Brazier, Austr. Mus. Cat., No. 15 (Cat. Mar. Shells Austr.) pt. 1, p. 12. P. J.
 1918. Hedley, Check List Marine Fauna, N.S.W., Moll. M. 33.

Shell smaller than the preceding, elongate oval, more than twice as long as broad.

Dorsal surface less calcareous, creamy, finely pustulose throughout, similarly indistinctly rayed, outer cone much less calcified, white.

Ventral surface a little more swollen anteriorly, the chitinous edge extending the whole length of the shell, the striae less squarely cut and more wavy, and extending further forward. Spine not produced, noticeably dorsally.

Inner cone large, striated, cream.

Dimensions: 40 x 18 mm. Average. Specimen figured: 57 x 21 mm.

Habitat: New South Wales.

SOLITOSEPIA ROZELLA, n.sp.

Plate xxi., figs. 6-7.

Shell large for the group, elongate oval, narrowed anteriorly, more than twice as long as broad, inner cone prominent coloured, deep ventral sulcus.

Dorsal surface calcareous, rose, finely pustulose with three median ribs, the middle one elevated, the side ones becoming obsolete laterally, diverging anteriorly, chitinous edge exposed about half the length of the shell.

Ventral surface very swollen anteriorly, a very deep broad median sulcus about half its length, absent anteriorly, the chitinous edge present all round but faint posteriorly and well marked in front: the posterior striae are wavy produced in front into a V in agreement with the sulcus.

Inner cone large and coloured, usually deep rose.

Spine short, thick, keeled ventrally and notched basally on the ventral side, swollen dorsally above the notch.

Dimensions: 135 x 47 mm. Type: Manly Beach.

Habitat: New South Wales.

SOLITOSEPIA PLANGON.

Plate xxiii., figs. 3-4.

1849. *Sepia plangon* Gray, Cat. Moll. Coll'n Brit. Mus., Cephal., p. 104. Port Jackson.

1886. Hoyle, Rep. Zool. Chall., Vol. xvi., p. 128, footnote.

1892. Brazier, Austr. Mus. Cat., No. 15 (Cat. Mar. Shells Austr.) pt. 1, p. 11. P. J.

1918. Hedley, Check List Marine Fauna, N.S.W., Moll. M. 33.

Shell medium, narrow, elongately oval, a little narrowed anteriorly, about three times as long as broad, inner cone obsolete, long ventral sulcus.

Dorsal surface calcareous, cream, finely pustulose throughout with a median rib and two fainter ones on each side diverging anteriorly, the chitinous edge exposed along the edges of the shell.

Ventral surface swollen anteriorly, a deep narrow median sulcus extending nearly the whole length, the chitinous edge becoming pronounced posteriorly where it passes in front of the spine: the striae advanced to a point with a fainter notch on each side. Spine keeled, sometimes the keel is obsolete.

Inner cone indistinct, coalescing with the edges of the striated area.

Dimensions: 110 x 30 mm. Specimen figured: Manly Beach.

Habitat: New South Wales.

Genus *MESEMBRISEPIA*, nov.

This genus is introduced for the species I call *M. macandrewi*, which is representative of an Adelaidean group to which *S. chirotrema* Berry belongs. The development of the spine is the characteristic feature in which it differs from *Solitosepia* and suggests a relationship with *Amplisepia*, which may be later discussed. The shell is large for the medium series, elongately oval, inner cone well marked and lengthened, spine round and almost pinched off and directed ventrally.

MESEMBRISEPIA MACANDREWII, n.sp.

Plate xxi., figs. 8-9.

Shell large medium, elongately oval, about three times as long as broad, inner cone very pronounced and lengthened, well marked ventral sulcus, spine rounded.

Dorsal surface calcareous, pinkish cream, outer cone white, rather wide chitinous margin exposed, an indistinct median ridge widening anteriorly, a less marked radial on each side, posteriorly these are defined by means of a lateral shallow gutter: very finely granulated anteriorly, coarsely irregularly pustulose, pustules elevated and lengthening into spiculate objects and vanishing on the base of the spine, which is almost separated from the shell by a deep depression.

Ventral surface swollen in the middle sector of the shell, the anterior portion flattening, the posterior deeply excavate: a wide median sulcus is prominent in the middle sector, obsolete posteriorly: striated area of median length, striae pointed.

Inner cone well developed, white, elongate and broad, finely striate longitudinally, advancing but leaving no marked siphonal depression.

Outer cone large, calcified, extending in front just round the inner cone and leaving a cavity behind from which the spine projects.

Spine long, rounded, directed ventrally.

Dimensions: 170 x 56 mm. Type: Shellharbour. G. MacAndrew.

Habitat: New South Wales.

Remarks: Odd worn shells were found on the Sydney beaches by Whitley and myself, but MacAndrew collected half a dozen, including the perfect one figured. Owing to the pinching in behind the spine most beach shells lack this important feature. This is the Peronian representative of *S. novaehollandiae* Hoyle, of which *S. chirotrema* Berry appears to be the benthal form.

Genus GLYPTOSEPIA, nov.

The "bones" of this group differ at sight in their colouration, but the marked feature is the loss of the inner cone, a feature of great significance, while the shape of the bone differs and the spine is very long and strongly keeled. On account of the confusion of the earliest named species as hereafter noted I name as type, *G. opipara*, though in it the features are exaggerated.

The shell is elongately oval, narrowed posteriorly and anteriorly, pinched in and a little attenuated forward: there is no inner cone apparent and there is no ventral sulcus, though the ventral surface is a little swollen anteriorly and the striated area is generally long. Dorsally the surface is coarsely granulate and salmon coloured, the outer cone semi-chitinous, bluish.

The shells belonging to this genus are very brittle and are generally broken when washed up on the beach.

GLYPTOSEPIA OPIPARA, n.sp.

Plate xxii., figs. 7-8.

Shell large for this group, elongate oval, about twice as long as broad, dorsal sculpture diagnostic, consisting of a median raised curved rib, flattened on each side and angulately carved laterally.

Dorsal surface very coarsely pustulose, flattened like a table, the edges steeply sheering, the table medially adorned with a rounded elevated rib cleanly isolated, and tapering posteriorly where a large chitinous edge is exposed; the whole of the outer cone being chitinous, while a chitinous mantle is spread over the posterior end of the shell.

Ventrally there is no median sulcus, but generally a line indicates its position, while the anterior swelling is more pronounced than in other members of the genus: striated area long, striae rather square-cut: the inner cone is missing as a separate feature, having coalesced with the border of the striated area: the chitinous outer cone advances in front of the spine, which is very long and sharply ventrally keeled.

Dimensions: 132 x 42 mm. Type. Masthead Is., Capricorn Group (Coll. C. Hedley).

Habitat: South Queensland, New South Wales, as far as Sydney (broken shells mostly).

GLYPTOSEPIA GEMELLUS, n.sp.

Plate xxii., figs. 1-2.

Shell medium, broadly elongate oval, about twice as long as broad, a long keeled spine, dorsal surface weakly ribbed, ventral surface anteriorly, little swollen, not sulcate.

Dorsal surface flattened, coarsely granulose throughout, very coarsely posteriorly, finer anteriorly where the shell is pointed and then sinuate laterally, a feature at present seen only in this group: a thin chitinous anterior margin develops posteriorly, so that the outer cone is little calcified and bluish, contrasting with the salmon colour of the rest of the shell.

Ventrally the surface is little swollen anteriorly, there is no median sulcus, the striated area long and the striae rather squarely produced: there is no inner cone and the spine is very long and ventrally keeled.

Dimensions: 96 x 35 mm. Type. Manly Beach.

Habitat: New South Wales.

GLYPTOSEPIA MACILENTA, n.sp.

Plate xxii., figs. 3-4.

Shell very similar to the preceding one, but long and narrow, the width about one-third the breadth.

Shell small for the medium series, narrowly elongate oval, attenuate and laterally sinuate anteriorly, a little narrowed posteriorly.

Dorsal surface finely granulose, a little flattened where a median rib is developed and the edges a little tabulate, diverging anteriorly: a narrow chitinous edge is exposed save at the anterior end, disappearing posteriorly, the outer cone thin, calcareous, bluish, contrasting with the salmon tint of the remainder of the dorsal surface.

Ventral surface little swollen anteriorly, striated area very long and squarish in front: no median sulcus.

Inner cone missing. Spine very long and ventrally keeled.

Dimensions: 92 x 28 mm. Type: Manly Beach.

Habitat: New South Wales.

GLYPTOSEPIA CULTRATA.

Plate xxii., figs. 5-6.

1885. *Sepia cultrata* Hoyle, Ann. Mag. Nat. Hist., Ser. v., Vol. xvi., p. 198, Sept. Off East Coast Austr., St. 163, 2,200 Fathoms.

1886. Hoyle, Rep. Zool. Chall., Vol. xvi., p. 133, pl. xx. Type locality corrected to St. 163 A., off Twofold Bay, N.S.W. 150 fathoms.

1889. Whitelegge, Proc. Roy. Soc. N.S.W., Vol. xxiii., p. 282.

1892. Brazier, Austr. Mus. Cat., No. 15 (Cat. Mar. Shells Austr.)
 pt. I., p. 12.
 1918. Hedley, Check List Marine Fauna N.S.W., Moll. M. 33.

Hoyle described and figured this species, and the specific name has been since used for other species. A fragment determined as this species by the late E. A. Smith, of the British Museum, proves to belong to a species quite unlike the figure. I have been unable to find a specimen in agreement, even after suggesting that both description and figure are incomplete or imperfect, so have reproduced the figures in this place.

Genus DECORISEPIA, nov.

This genus is introduced for a remarkable species which shows a rounded spine in addition to which it lacks the inner cone, and the "outer cone" is large and scarcely calcareous. Type *D. rex* infra.

DECORISEPIA REX, n.sp.

Plate xxii., figs. 9-10.

Shell large for the medium series, elongately ovoid, narrowed anteriorly, more than twice as long as broad, no inner cone and no ventral sulcus.

Dorsal surface finely pustulose, showing three ribs, the median one rounded, prominent, the lateral ones rounded divergent: a large chitinous margin is exposed which occupies most of the outer cone and advances in front of the spine as a broad horny projection: outer cone only a little calcareous and whitish contrasting with the deep rose of the rest of the shell.

Ventral surface little swollen anteriorly, striated area long, showing no median sulcus, striae rounded.

Inner cone absent, coalescing with the edges of the striated area.

Spine medium, rounded.

Dimensions: 119 x 40 mm. Type: Manly Beach.

Habitat: New South Wales.

Genus ARCTOSEPIA, nov.

A peculiar group of very small narrow shells is known of which the only Australian representative yet described is *Sepia braggi* Verco. The only generic name in existence is *Doratosepion* Rochebrune proposed for the Japanese species *S. andreana* Steenstrup. In Japanese waters more than one generic form appears to exist, and it is suggested that at least a subfamily is necessary to include these Cephalopods. In order to enable correct study of the Australian animals to be undertaken, I therefore propose the new generic name *Arctosepia* and name *A. limata* as type. It is noteworthy that none of this group has yet been noticed in Queensland, and that shells of *A. braggi* are sometimes numerous in southern Australia, a locality whose cuttle fishes otherwise suggest no affinity with those of Japan.

Shells very small, very narrow, ventrally swollen, posteriorly sweeping forward and narrowing, a chitinous outer cone appearing as a hood, the spine rounded and more or less curved, inner cone missing, fusing with the edges of the striated area.

ARCTOSEPIA LIMATA, n.sp.

Plate xxiii., figs. 7-8.

Shell very small, narrowly elongate, attenuate at both ends, more than four times as long as broad, no inner cone nor ventral sulcus, spine rounded.

Dorsal surface calcareous, pink, comparatively smooth, but showing very

regular arched growth lines, an indistinct median elevated rib present, widening a little anteriorly: a very small chitinous edge present but posteriorly this develops into a curious chitinous hood, passing in front of the spine.

Ventral surface swollen anteriorly, no ventral sulcus but a median narrow linear groove present the whole length of the shell, striae rounded, becoming pointed with age: unstriated area a little more than one-fourth the length of the shell: the chitinous edge expands into an outer cone, very little calcified, and presenting a hood-like appearance.

Spine long, thin, rounded, with a slight tendency to curvature dorsally.

Dimensions: 36 x 8 mm. Type: Manly Beach.

Habitat: New South Wales.

Remarks: This is a smaller species than *A. braggi* Verco, which lives in South Australia, Victoria and North Tasmania, proportionately broader, less narrowed posteriorly, different shape, etc.

ARCTOSEPIA VERSUTA, n.sp.

Plate xxiii., figs. 5-6.

Compared with the preceding, this species is smaller and differs more at sight than is indicated by measurement.

Dorsally the median rib is less pronounced, the growth lines more closely packed, the posterior end much less rapidly tapering.

Ventrally the anterior portion is more swollen and posteriorly less excavate: the striae are more numerous, straighter, becoming rounded with age, a longer unstriated area being left.

Spine shorter, rounded, with a strong tendency to curve first dorsally then ventrally.

Dimensions: 33 x 7 mm. Type: Manly Beach.

Habitat: New South Wales.

Genus AMPLISEPIA, nov.

I am introducing this generic name for *Sepia apama* Gray, whose sepiion differs entirely from that of the remainder of the Australian species yet known, save its eastern representative *A. verreauxi* Rochebrune. The sepiion is very large, elongately oval, tapering posteriorly, broadly rounded anteriorly, the dorsal surface flattened, finely pustulose anteriorly, coarsely granulose posteriorly, the outer cone developed and crassly thickened, the spine missing: ventrally it is very much swollen anteriorly, deeply excavate posteriorly, the outer cone elongated and crassly thickened, the inner cone appearing as an elongate glaze, inside which appears a coarse granulose pustulate development. In the juvenile stages the sepiion is more normal, the inner cone well marked, as in *Solitosepia*, and a small spine present.

AMPLISEPIA VERREAUXI.

Plate xxiii., figs. 1-2.

1884. *Ascarosepion verreauxi* Rochebrune, Bull. Soc. Philom. Paris, Series 7, Vol. viii., p. 98. Sydney, N.S.W.

1889. *Sepia apama* Whitelegge, Proc. Roy. Soc. N.S.W., Vol. xxiii., p. 282.

1892. Brazier, Austr. Mus. Cat., No. 15 (Cat. Mar. Shells Austr.) pt. I., p. 11. P. J.

1918. Hedley, Check List Marine Fauna, N.S.W., Moll. M. 33.

Not *Sepia apama* Gray, Cat. Moll. Coll'n Brit. Mus. Cephal., 1849, p. 103. Port Adelaide, S.A.

The characters of the species are those of the genus, but this form may be distinguished from the Adelaidean type by the narrower inner cone, the smaller phragmocone and the less prolonged mucronal area. It may grow to a larger size, the measurements of the largest one handled up to the present being 465 mm. long by 170 mm. broad, thus surpassing the Japanese *S. hercules*, but larger ones have been noted, but not yet preserved.

Genus ACANTHOSEPION.

Acanthosepion Rochebrune, Bull. Soc. Philom. Paris, Ser. 7, Vol. viii., p. 100, 1884. Type (fide Mayer, Zool. Jahresbericht, 1884). *Sepia aculeata* Hasselt.

This group is well distributed throughout the Indo Malayan Archipelago, and may be regarded as distinctive of that region. Two or three offshoots are known and these will be discussed in a later essay. Meanwhile one of these reaches into northern New South Wales and worn shells are sometimes found on the Sydney beaches. This one is of the medium series, with the inner cone produced ventrally as a ledge: the typical form has the inner cone similarly produced but more pronounced: the spine is not keeled, the dorsal surface rounded, coarsely pustulose, the ventral surface not much swollen anteriorly but deeply excavate posteriorly, a wide shallow sulcus present.

ACANTHOSEPION WHITLEYANUM, n.sp.

Plate xxiii., figs. 9-10.

Shell large for the medium series, broadly elongately oval, anteriorly a little narrowed, more than twice as long as broad, inner cone produced ventrally as a ledge, long shallow wide ventral sulcus.

Dorsal surface coarsely pustulose, pustules larger and massing laterally towards the posterior end but finer adjacent thereto, while the outer cone is finely semi-chitinous: a large chitinous margin is exposed: no definite ribbing is present but an indistinct triangular area may be discerned with indications of a median rib and lateral semi-ribbing.

Ventral surface a little swollen anteriorly and deeply excavate posteriorly, where it becomes as thin as paper, and hence in shells washed up on the beach the spine is generally missing: a shallow wide sulcus extends nearly the whole length of the shell: this is striate, the unstriated area being less than one-fifth the length of the striate, and at its sides a smooth edge is seen: the striated area advances with a rounded elongate sweep.

Inner cone appearing as a faint glaze laterally, but becomes more pronounced posteriorly, sweeping in front of the siphonal cavity to form a small calcareous ledge.

Spine long, rounded, not keeled, produced from a little calcareous rim almost detached from the outer cone.

Dimensions: 168 x 65 mm. Type: Port Macquarie, New South Wales (H. S. Mort).

Habitat: New South Wales.

Note.—The beautiful illustrations which adorn this essay have been prepared by Miss Joyce K. Allan, of the Australian Museum, and present a series hitherto unequalled in any previous publication. The author's thanks are here tendered with the knowledge that whether his conclusions be wholly accepted or not, the accurate figures will mark a milestone of progress of inestimable value to workers in every land. The shells figured, and long series supporting the results, are in the Australian Museum, being presented by the various collectors already named. The series show in many cases growth stages from a few millimetres to extreme age, and these have been utilised and will be fully described in the larger essay.

EXPLANATION OF PLATES.

Plate xxi.

- Fig. 1. Ventral surface of *Solitosepia liliana* Iredale.
2. Dorsal surface.
3. Side view.
4. Ventral surface of *Solitosepia mestus* Gray.
5. Dorsal surface.
6. Ventral surface of *Solitosepia rozella* Iredale.
7. Dorsal surface.
8. Ventral surface of *Mesembrisepia macandrewi* Iredale.
9. Dorsal surface.

Plate xxii.

- Fig. 1. Ventral surface of *Glyptosepia gemellus* Iredale.
2. Dorsal surface.
3. Ventral surface of *Glyptosepia macilenta* Iredale.
4. Dorsal surface.
5. Dorsal surface of *Glyptosepia cultrata* Hoyle.
6. Ventral surface.
7. Ventral surface of *Glyptosepia opipara* Iredale.
8. Dorsal surface.
9. Dorsal surface of *Decorisepia rex* Iredale.
10. Ventral surface.

Plate xxiii.

- Fig. 1. Ventral surface of *Amplisepia verreauxi* Rochebrune.
2. Dorsal surface.
3. Dorsal surface of *Solitosepia plangon* Gray.
4. Ventral surface.
5. Dorsal surface of *Arctosepia versuta* Iredale.
6. Ventral surface.
7. Dorsal surface of *Arctosepia limata* Iredale.
8. Ventral surface.
9. Dorsal surface of *Acanthosepion whitleyanum* Iredale.
10. Ventral surface.

THE BURROWING HABITS OF *TACHYGLOSSUS ACULEATUS*.

By HARRY BURRELL, C.M.Z.S.

(Plate xxiv.)

In an endeavour to test accurately the burrowing habits of an Echidna (*Tachyglossus aculeatus*) I first procured a clear glass tank, open at the top and measuring twelve inches across, twelve inch in depth, and eighteen inches in length. This observation receptacle I elevated on a skeleton bench, so that I could observe conveniently from below, above, at both sides and ends.

My subject was a medium-sized, freshly caught male Echidna, possessing spurs about $\frac{1}{2}$ inch in length, apparently functionless. After shovelling some red soil into the tank I placed the coiled-up creature feet down, on the centre of that earth surface, and watched preliminary operations from above.

After a little persuasion the creature commended to dig down with the claws of both fore-paws simultaneously. Then it systematically tossed upwards the excavated earth at either side of its body, until steadily increasing mounds of fine earth accumulated, concealing the spines projecting above the surface. Now that my view was obstructed from above, I followed on with a view from below. This was secured by lying on my back, with face beneath the glass bottom. From this position I noticed the earth moving beneath the creature's fore-paws.

More and more the earth became disturbed, until the tips of the fore-claws appeared through the now broken under soil. At this stage the digger had descended about three inches from the surface. To make clearer the exact direction and method entailed in the movements of the paws, during the downward and forward trend, I removed the animal, emptied the tank completely, and then whitewashed the bottom evenly on the inside. After thoroughly drying the wash, I replaced the earth and again induced the Echidna to carry on operations.

On this occasion I took the precaution of placing the tail of my subject close to one end of the receptacle, so as to allow more space for forging ahead, as is the Echidna's custom when digging on clear ground. Being somewhat familiar now with the movements at the initial stage, I made a point of watching the actions of spines, tail, and hind quarters separately. By so doing, I observed that the frequently trailed stub tail appeared to prod the earth occasionally—obviously as a point of resistance against any backward trend occasioned while obliquely sinking.

The hind legs were used principally to force the shoulders in the direction desired, by slowly trampling down the sloping track created by the sweeping movements of the excavating fore-claws. Between times the spines obtained secure grips in the side walls as the creature descended.

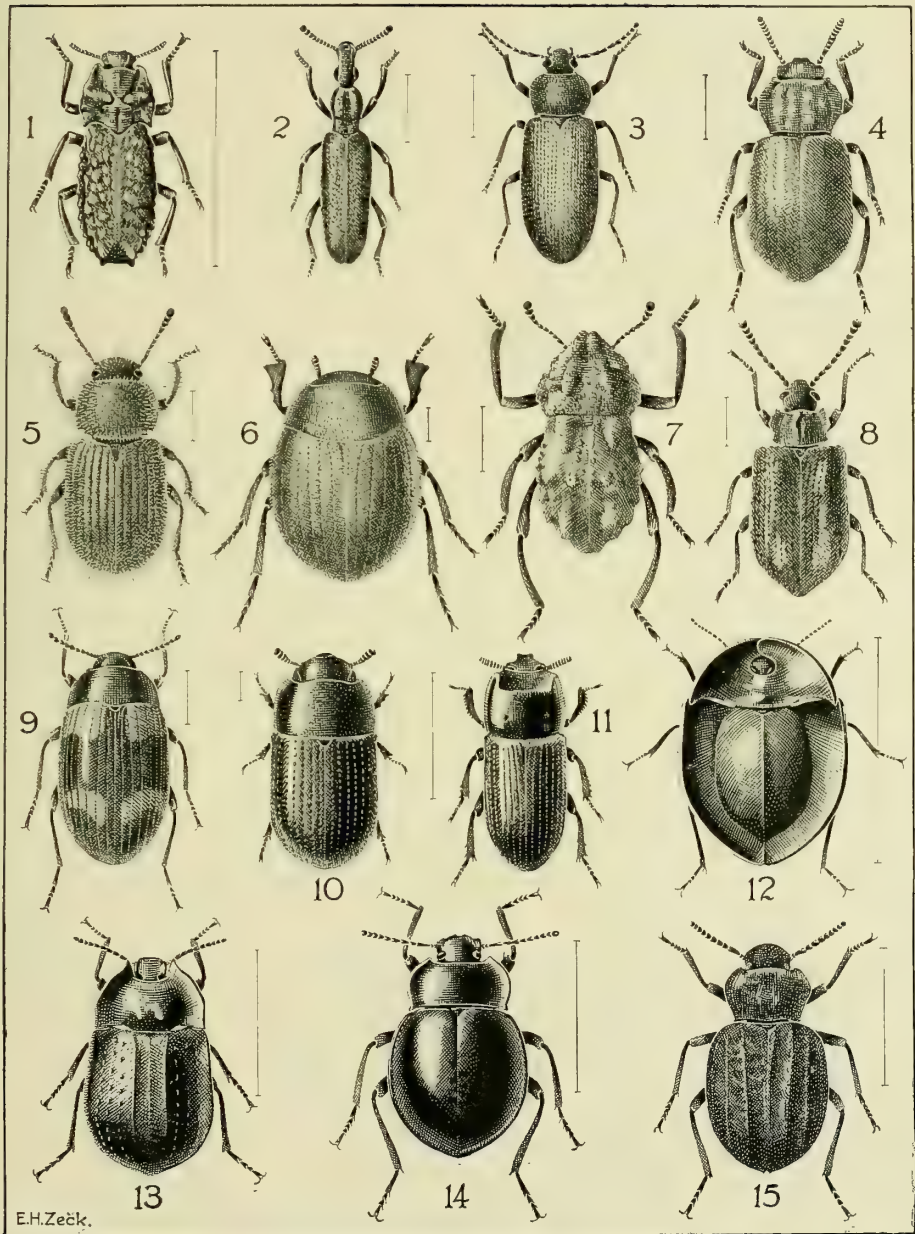
Another peep from below, and a complete pattern could be distinctly seen scrolling the whitewash. This was carried on for four inches along the glass bottom before the hind feet made a discernible impression thereon.

Repetition of the above experiment, and confirmation secured by similar trials on solid earth with the same animal, as well as with other specimens, have led me to record the following notes as a fair diagnosis of the complete protective burrowing habits of *Tachyglossus aculeatus*.

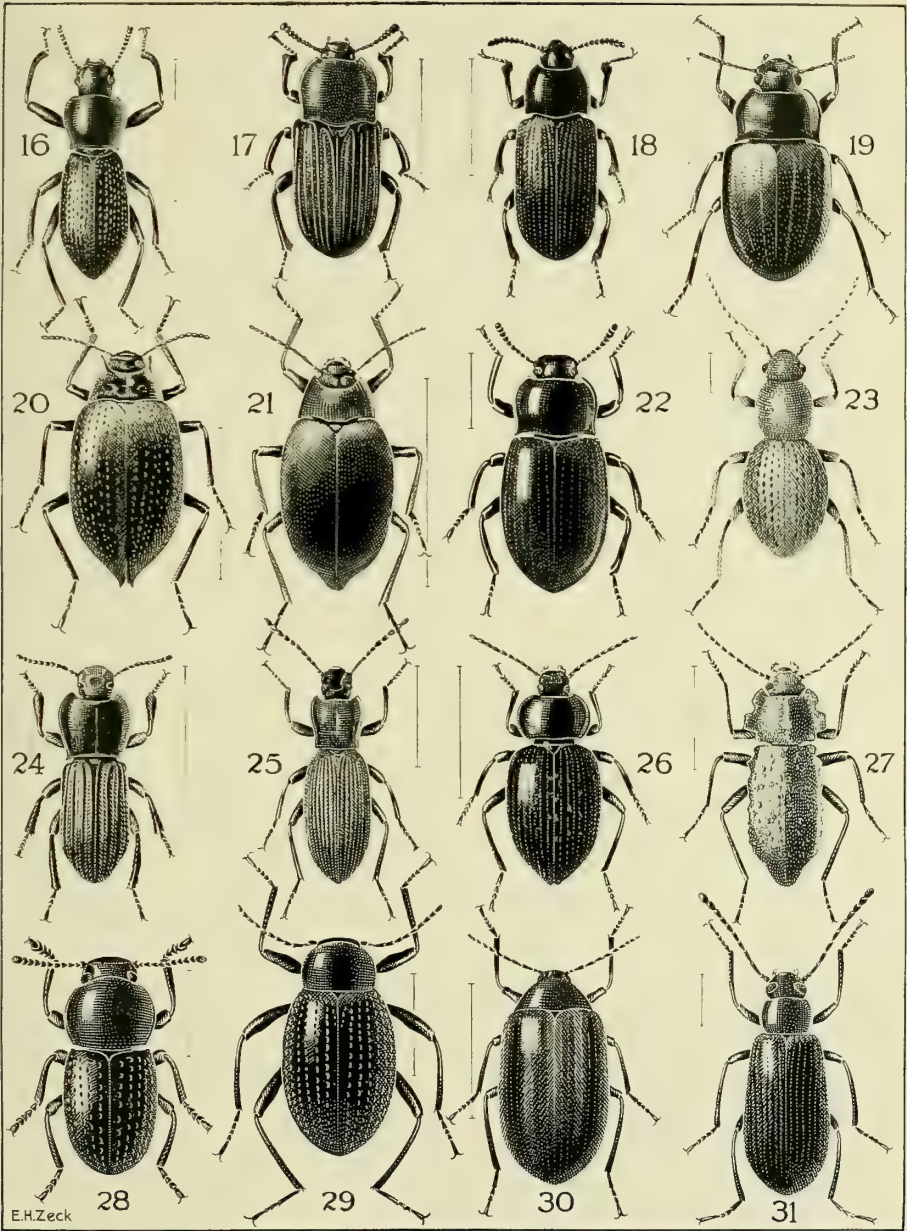
Firstly, an alarmed Echidna presses itself to the earth's surface with neck, head, and muzzle tucked tightly beneath the body. At this stage the quills about the upper neck and shoulders pierce the ground, as also do those fringing the underparts and hind-quarters. The tail, meanwhile, is rigidly pressed to the earth. Both fore-paws, placed together, and reaching beyond the nape of the neck, sweep around spasmodically (according to sinking conditions) to the sides, where the upturned palms throw the excavated soil free upon the surface; there it remains in miniature mounds, intermingling with the exposed body spines. Meanwhile, the fore-paws return to their initial position, to repeat the action in every detail. Each time that a throw-up of earth occurs, all quills available for service mechanically manoeuvre for a fresh hold below. Thus, an auxiliary purchase is obtained to secure and fortify the digger in its temporary stronghold.

To keep the fore-parts up to requirements, the hind feet traverse the inclining track previously graded by the cutting fore-claws until the desired depth is reached. This depends upon the size of the animal. There it relinquishes deep digging, and gradually ascends until all unprotected parts of its exterior become equally concealed. The head at this juncture occupies the central, and therefore the deepest, part of the inverted-helmet-like excavation. This hollow rarely measures more than six inches in depth, although the ejected earth piled up at either side makes it appear deeper.

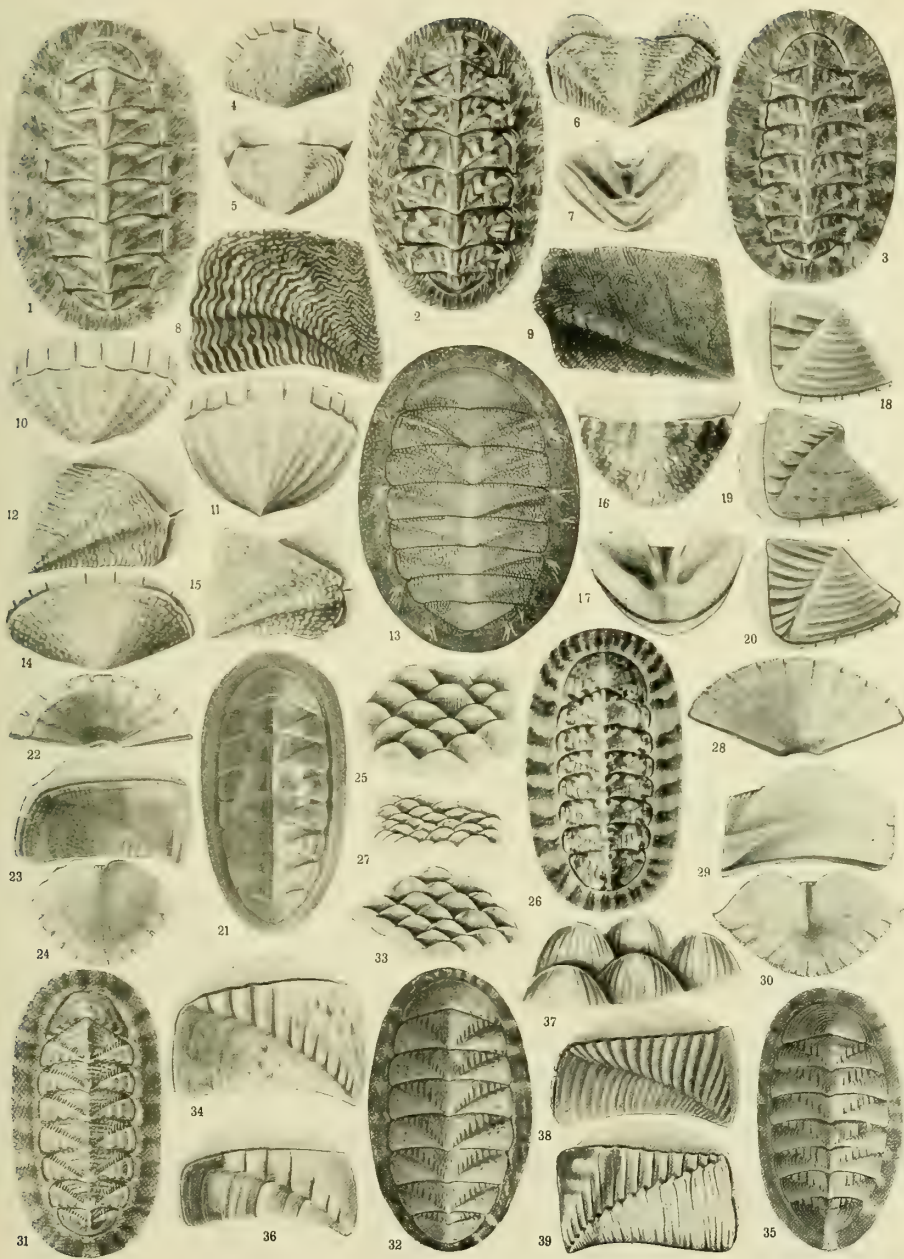
As regards the abnormally enlarged, curved claw of the second pedal digit, this I find is principally used for gripping when the animal is burrowing, or climbing rough mountains. Possibly, too, it is used during the sexual embrace. Respecting its adaptability for toilet purposes (suggested by Professor Wood-Jones, in his book, *The Mammals of South Australia*, Part I, Page 42), from personal experiences with live specimens in the field, such a suggestion does not appeal to me from any point of view. If the claw curved inward instead of outward, perhaps there would be some possibility of its being used for scratching purposes on certain parts of the Echidna's body. But there seems to be little doubt that the main function of this member is to aid the mammal in the three processes described.

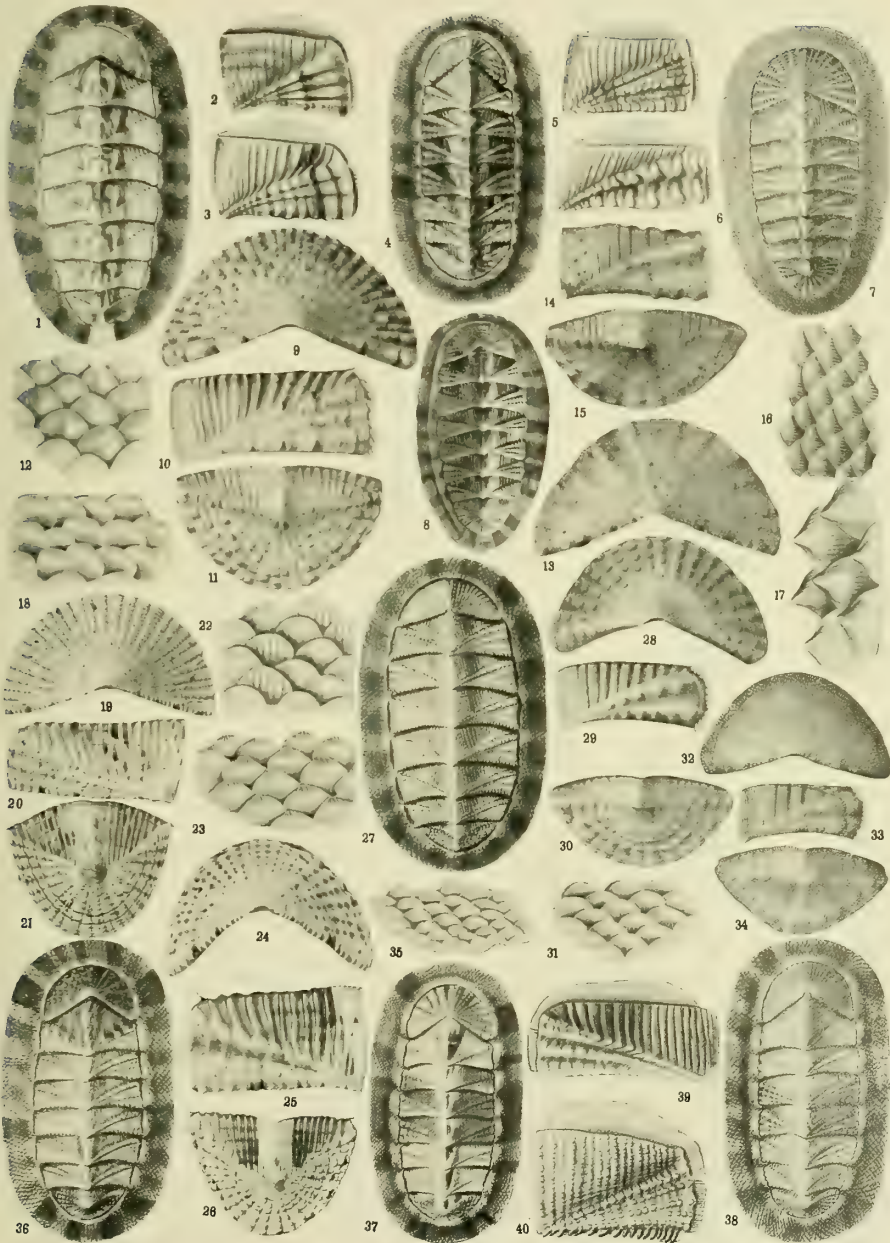


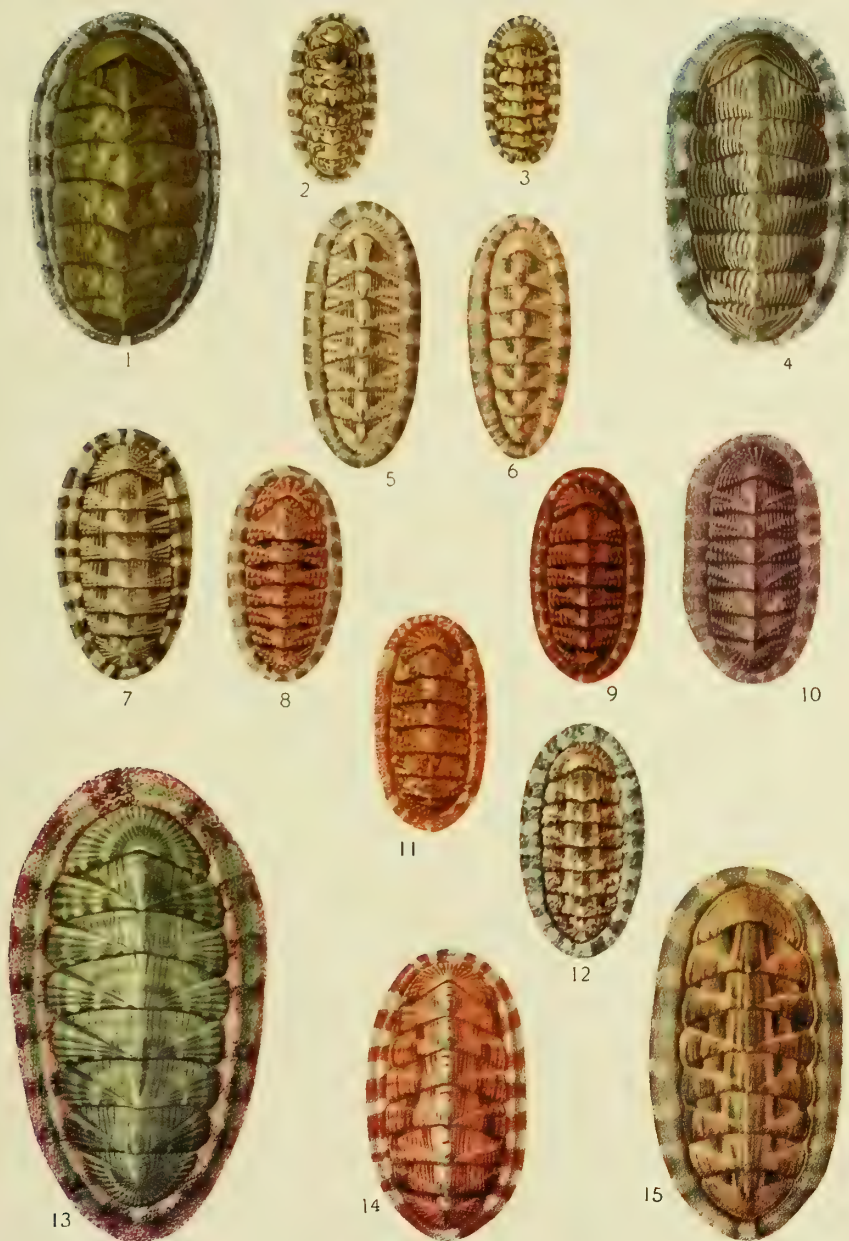
Australian Tenebrionidae.

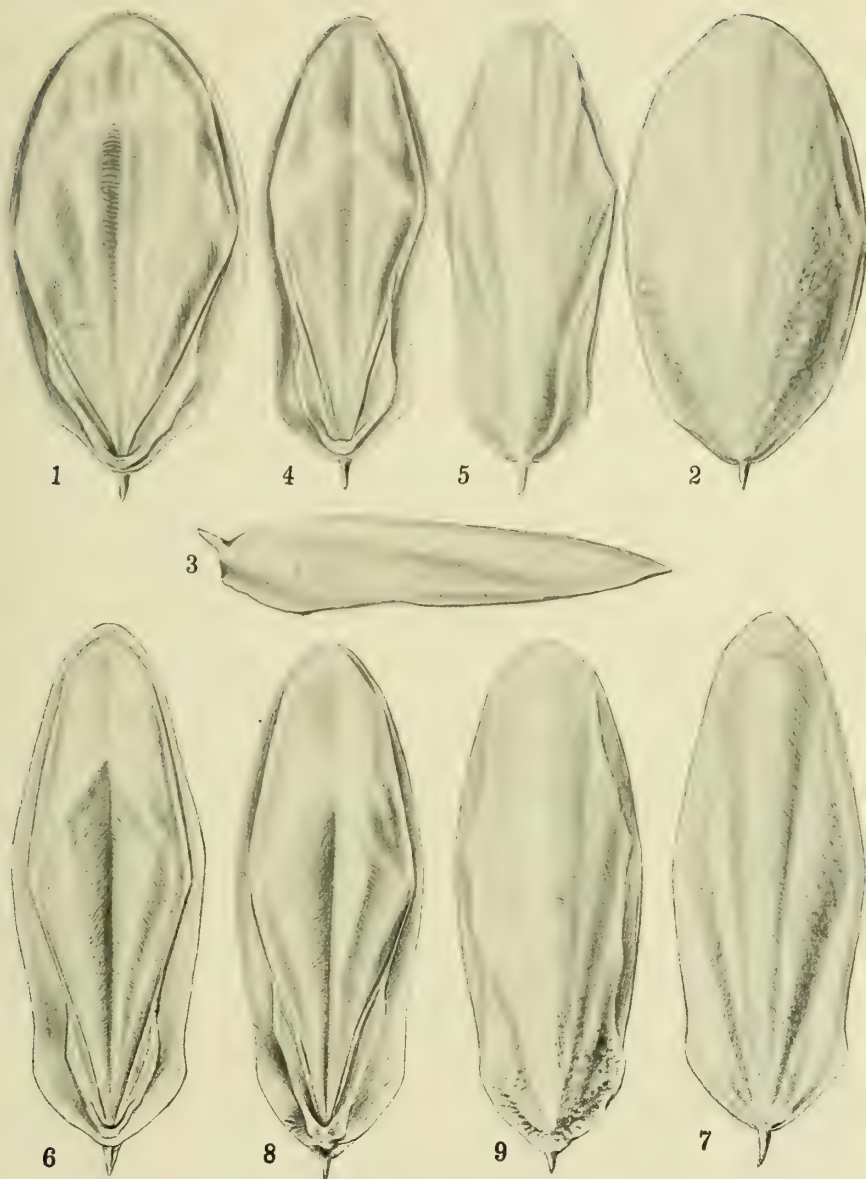


Australian Tenebrionidae.



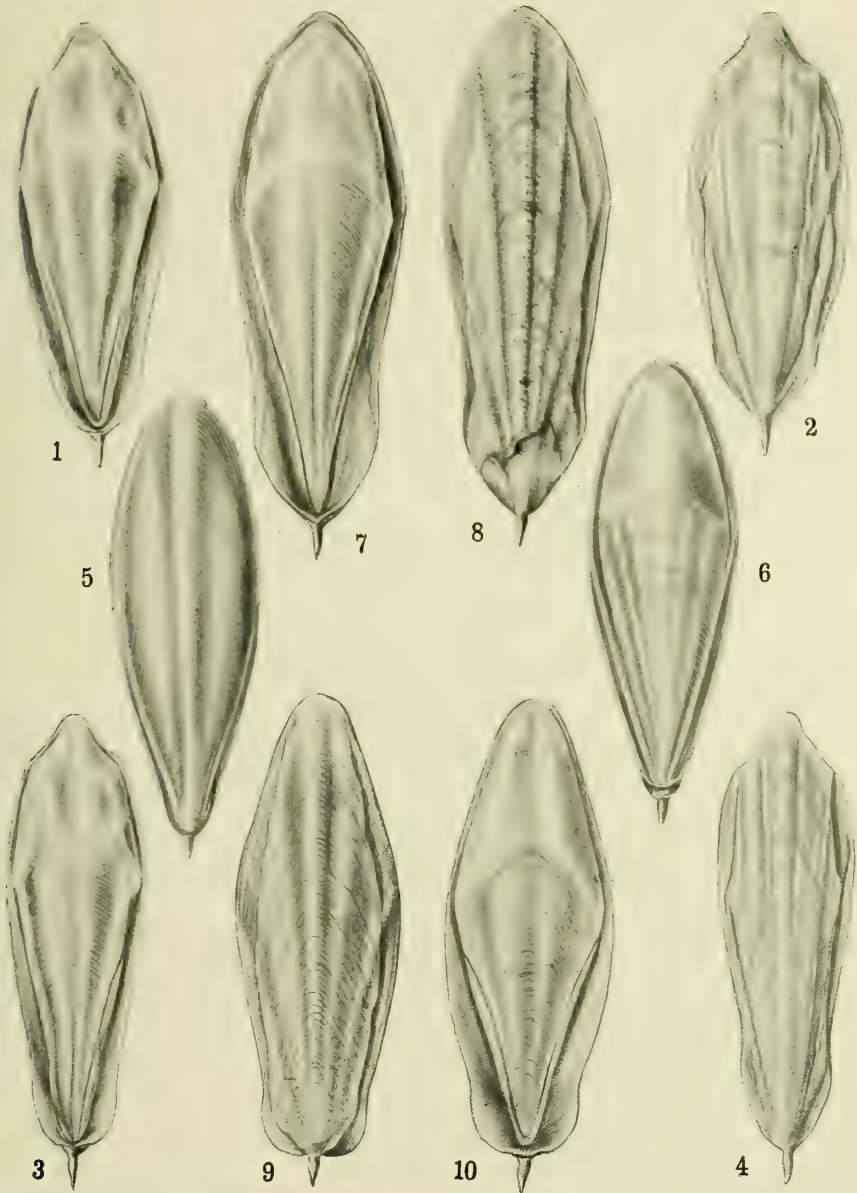






Drawn by Joyce K. Allan.

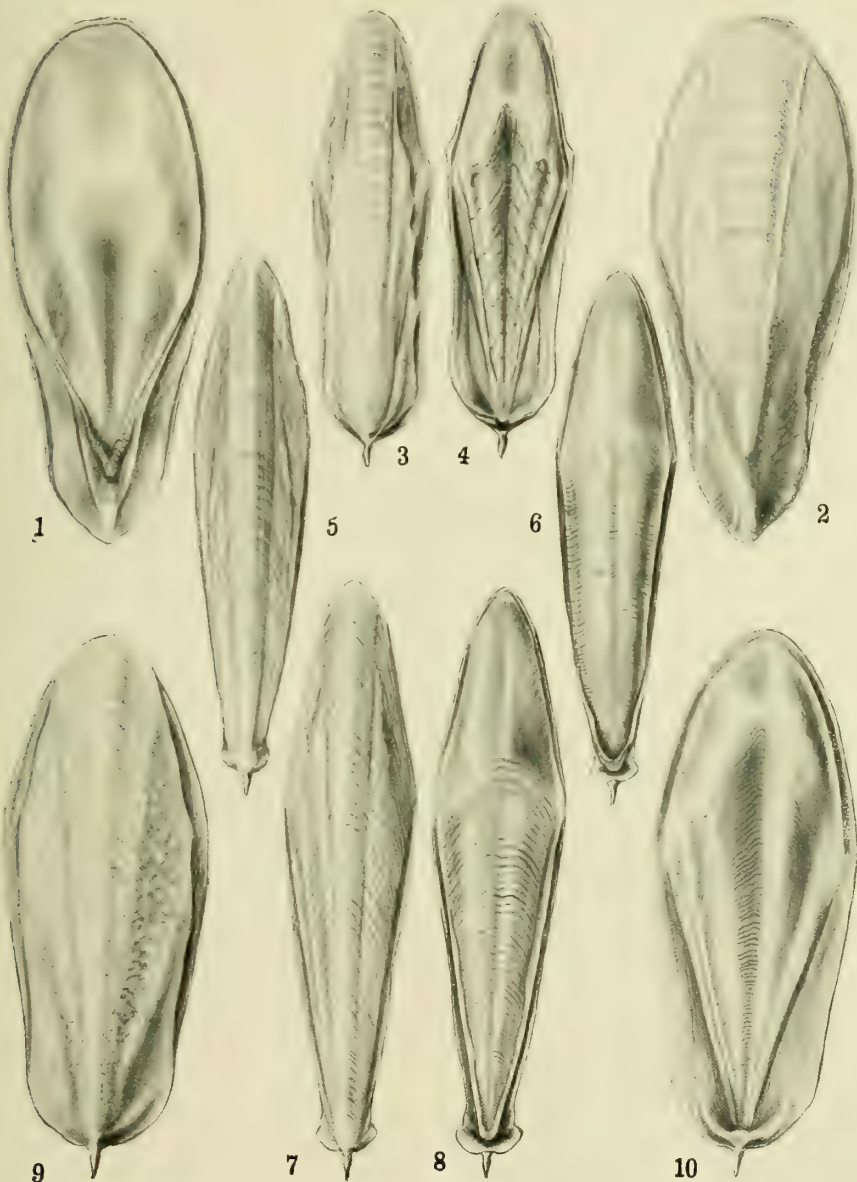
Australian Cuttle-Fish Bones.



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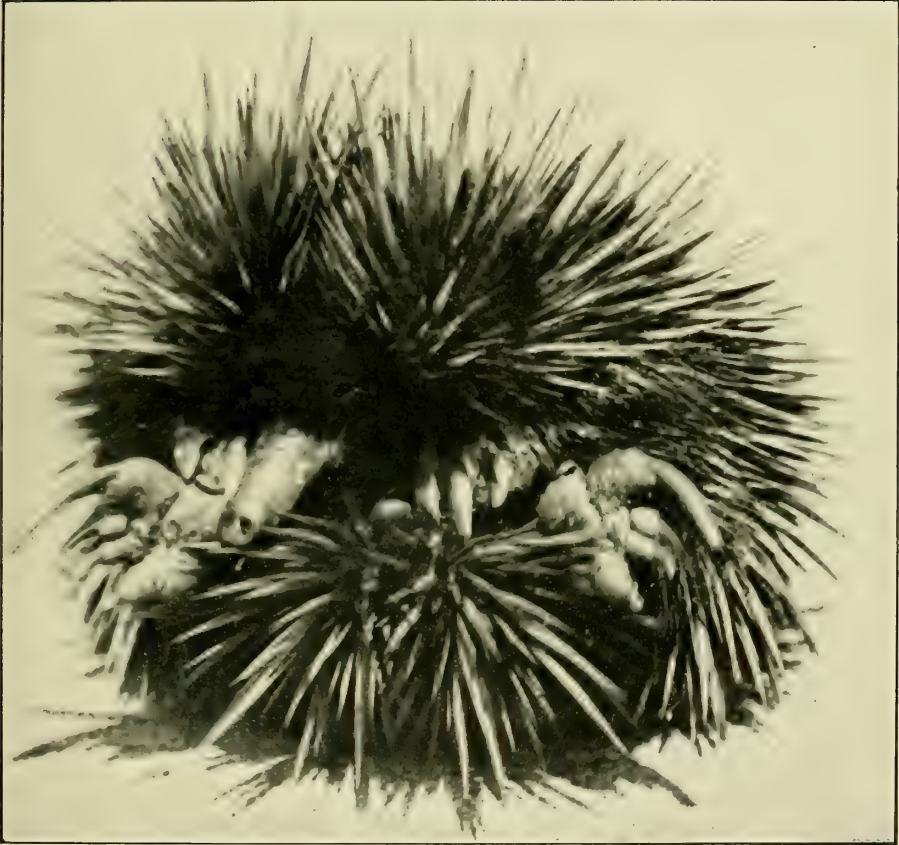
Australian Cuttle-Fish Bones.





Drawn by Joyce K. Allan.

Australian Cuttle-Fish Bones.



Tachyglossus aculeatus, curled up, showing the curved claw, the uses of which are discussed in Mr. Burrell's paper.

Photograph by Harry Burrell.

Royal Zoological Society of New South Wales.

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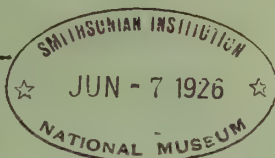
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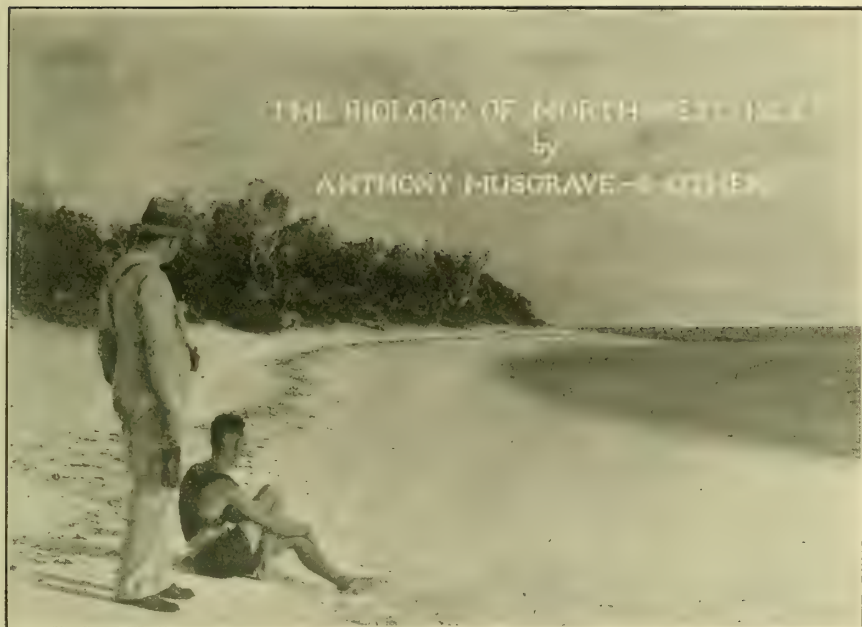
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A. NARRATIVE.

By ANTHONY MUSGRAVE, F.E.S.

(*By permission of the Trustees of the Australian Museum.*)

In November, 1925, the writer was one of a party which left Sydney for the purpose of investigating the biology of North-west Islet in the Capricorn Group, off the Queensland coast.

The trip was organised and arranged by Mr. E. F. Pollock, the Hon. Secretary of the Royal Zoological Society of New South Wales, after correspond-



Map showing the Capricorn Group in relation to the Queensland coast.

ence with Mr. Otho Webb, of Darr Creek, Queensland. Certain concessions were secured by Mr. Pollock from the New South Wales and Queensland Governments which materially reduced the expenses of the several ladies and gentlemen he invited to accompany him.

At Brisbane three Queensland members joined the party, and at Gladstone the services of a cook were requisitioned, bringing the number of the party up to fifteen. The Queensland members consisted of: Mr. Otho Webb (Darr Creek); Miss Hilda Geissmann and Mr. W. Curtis (Tambourine Mountain); while the New South Wales members were:—Mr. E. F. Pollock (leader); Mr. and Mrs. C. Coles; Mrs. V. Lowe; Miss E. Chase (University of Sydney); Mr. G. P. Whitley (Australian Museum); Dr. W. MacGillivray (Broken Hill); Mr. P. A. Gilbert; Mr. J. F. Newns; Mr. C. Nolan; and the writer.

The New South Wales members left Sydney on the 22nd November, reached Brisbane on the 23rd, and arrived next day at Gladstone, Port Curtis.

On the morning of the 25th, the party embarked on the cutter "Lyola" for North-west Islet, and, after a somewhat rough trip across the 47 miles stretch of sea, arrived at the islet at dusk. On arrival, the members were hospitably entertained by the turtle-hunters at their turtle-soup canning factory. Only the blankets were landed that night, and the party slept on the beach above high-water mark. Next day tents were erected at a spot selected by Dr. MacGillivray and Mr. Pollock, at a short distance from the factory. Camp was broken on Monday, 14th December, about three weeks having been spent on the islet, though circumstances compelled the writer to leave the island on the 6th December.

During our stay, those interested in the biological problems of the islet busied themselves with the preservation of specimens, writing notes, or taking photographs, while those not concerned with natural history wandered over reef and islet and led a care-free existence, though ever-ready to lend a helping hand. The heat was intense, but at low tide the reef and the lagoon provided a means of escape from the glare and the burning rays of the sun, and most of the party took advantage of the opportunity to wade through the cool waters in search of shells or other marine animals. At high tide, sharks appeared in the lagoon, and so rendered it unsafe for bathers.

The avifauna of the islet was investigated and photographed by Dr. MacGillivray, Mr. Gilbert, Mr. E. F. Pollock, Mr. Otho Webb, and Miss Geissmann, all of whom were experienced in field work. At low tide, Miss Chase and Mr. Whitley occupied themselves with the marine fauna, while at high tide they emulated the author in collecting insects or preserving material secured. Miss Geissmann and Mr. Coles made interesting observations upon the turtles, and brief accounts have been published by them in Queensland papers. The writer in collaboration with Mr. Whitley has written in *The Australian Museum Magazine*, a popular account, embracing all the information available about the North-west Islet turtles.

Since the return of the party to civilisation, the specimens secured have been submitted to specialists for identification, and their restarches are appended. For assistance in naming material I am indebted to the staffs of the Queensland and South Australian Museums, as well as to my colleagues of the Australian Museum. Mr. Hedley, the Director of the Great Barrier Reef Investigation Committee, has placed his knowledge of the Capricorn Group and Barrier Reef at my disposal, and has further assisted in identifying the corals collected.

In the present account it has been the aim of the author, as far as possible,

to give lists of the animals of the different groups or a reference to them in the bibliography. In this manner, it is hoped that the contribution will serve to bring our knowledge of the animal and plant life of the group up-to-date, and act as a basis for future work in biological investigation.

With a view to limiting the number of references in the text, the date of publication of a paper is usually placed after the author's name and the title and other particulars may be consulted in the bibliography.

HISTORICAL.

The first naturalist to visit the Capricorn Islands was Professor J. B. S. Jukes (1), the naturalist on H.M.S. "Fly," and in his narrative he describes One Tree, Wreck, and Heron Islands.

H.M.S. "Fly" and "Bramble" surveyed the Capricorn Group in 1843, and the results of their surveys are embodied in the Admiralty chart embracing that portion of the Queensland coast.

In October, 1904, a small party of naturalists visited Masthead Island, and an excellent general account of the island, together with a list of the Mollusca, later appeared under the pen of Mr. Charles Hedley (2). Two other members of the party, Messrs. F. E. Grant and A. R. McCulloch, described the Crustacea of the island and of Port Curtis.

In October, 1910, some members of the Royal Australasian Ornithologists' Union visited the group for the purpose of studying the birds. Camps were established on North-west and Masthead Islands, and parties made excursions to neighbouring islets; North Reef, Tryon, Erskine and Heron Islands being visited. The narrative of the expedition was later written by Mr. Charles Barrett (3), and the birds identified on the islands listed by Messrs. A. J. Campbell and Captain S. A. White.

Several parties of zoology students from the University of Queensland have visited Masthead since 1910, the late Mr. A. R. McCulloch, of the Australian Museum, being a member of two parties, and Mr. E. Le G. Troughton, of the same institution, of one.

The proximity of the islets to the large town of Rockhampton, has brought them into favour with the general public as ideal spots for holiday camps, though the absence of water will always be an important factor in keeping prospective visitors away. Only North-west Islet boasts a water supply, and this is caught in tanks at the turtle-soup canning factory and is the property of the proprietors. We took a large supply of water with us from the mainland, but, as this proved inadequate, the turtle-hunters kindly permitted us to draw on their supplies.

THE CAPRICORN GROUP.

North-west Islet is one of a series of reefs or reef-girt islands constituting the Capricorn Group, which link with the islets of the Bunker Group to form a chain which extends from North Reef to Lady Elliott Island. The islets and reefs of the Capricorn Group are as follows:—North Reef, Tryon Island, Wilson Island, Bloomfield Reef, Wreck Island, North-west Island, Irving Reef, Polmaise Reef, Masthead Island, Erskine Island, Wistari Reef, Heron Island, Sykes Reef, One Tree Island, Lamont Reef, and Fitzroy, Llewellyn and Boulton Reefs.

(1) Voyage of H.M.S. "Fly," i., chapter 1, 1847.

(2) Proc. Linn. Soc. N.S. Wales, xxxi., 1906, 453-479.

(3) The Emu, x., 1910, 181-194.

The Bunker Group consists of three small coral islets:—Lady Musgrave Islet (No. 1), Fairfax Islet (No. 2), and Hoskyn Islet (No. 3).

The Tropic of Capricorn passes between Heron Island and Wistari Reef, and North-west Islet lies to the north of the Tropic.

The group is not to be regarded as part of the Great Barrier Reef system, as Mr. Hedley has pointed out. Swain's Reefs which lie to the north of the Capricorn Group mark the southern limit of the Great Barrier Reef.

NORTH-WEST ISLET.

Plate xxv., fig. 1.

North-west Islet is a small coral islet or pseudo-atoll about a mile in length, about three miles in circumference, and about 300 acres in extent. It is encircled by a coral reef which is somewhat irregularly oval in shape, measuring 6 miles in length by 2 in breadth, the ends of the oval lying east and west. The sea surrounding the reef is from 15 to 20 fathoms deep. The islet, which consists of sand and coral-sand rock, is raised but a few feet above high water mark, and is situated at the western end of the oval, the reef being only about half a mile from the shore. A fine sandy beach encircles the islet, interrupted only at its northern and southern ends by outcrops of coral-sand-rock. At the northern end, too, the sea has encroached upon the islet, probably as the result of storms, and many of the trees are uprooted and overhang high-water mark. Though devoid of any natural water supply, the islet is densely wooded, the *Pisonias* being the dominant plants and rising to a height of 50 feet. These trees flourish in the sandy soil, and their boughs are laden with the nests of the White-capped Noddy Tern, while below in the sandy soil, Wedge-tailed Shearwaters or Mutton-birds honeycomb the soil with their burrows, rendering walking a precarious pastime. Every few yards one sinks to the knees in a burrow as the treacherous surface gives way, the noise of one's fall sending the Noddies off their nests in alarm and gibbering at the unfortunate who had thus disturbed their tranquillity.

Apart from birds and turtles, the only outstanding forms of animal life on the islet are the domestic cats and fowls which have been liberated by former owners of the turtle factory, and which have gone wild and taken to the forest. In the early mornings we were awakened by the crowings of chanticleers from the *Pisonia* forest, and parties crossing the islet found several hens nesting. In view of the scarcity of water it is remarkable that the fowls have survived. From some roosters shot by one of the lads from the turtle-canning factory, it would appear that they are fast reverting to the jungle fowl strain. Cats were seen by several of the party, and they doubtless destroy many nesting sea-birds.

THE REEF.

Plate xxv., fig. 2, 3.

Plate xxvi., fig. 4.

Between the shore and the reef-crest is a lagoon, which at low tide is extremely shallow, and one may easily walk out to the reef-crest.

The reef-crest itself is clearly defined at low tide as a circle of black dots or "nigger heads," as they are termed. These are large fragments of coral torn up from the base of the reef by storms, and which now lie stranded on its crest. Some of these storm-stranded coral boulders are very large in size, and from the shore at high tide present the appearance of fishing boats.

The encircling coral boulders with the shallow lagoon give the islet the appearance of an atoll, a condition which prevails at Masthead, as well as at

other islets of the group. Such an islet is aptly termed a pseudo-atoll. The large nigger-heads are much eroded, their contours showing jagged edges rising from hollowed-out cavities, which latter frequently serve to shelter the large loricate, *Amphitomura gemmata*. Mr. Hedley has dealt with the subject of the erosion of the "nigger-heads" in his account of Masthead Island (1906). From the reef crest the reef slopes down gradually as a flat coral wall washed by the sea, its surface broken here and there by large pools in which grow fine corals, tabular and branching forms of *Acropora*.

At low tide the water in the lagoon runs out to sea, falling over the reef crest in a series of small cascades, the outer sea appearing to be below the level of the lagoon. As the tide ebbs, smaller blocks of dead coral stud the reef and the lagoon. Beyond the edge of the reef is a light blue-green line of water, and beyond this again the darker blue of the open sea.

THE LAGOON.

Plate xxvi., fig. 1, 3.

Plate xxvii., fig. 3, 4.

The area between the shore and the reef-crest is divisible into well defined zones. Thus, proceeding shorewards from the magic circle of coral boulders, we meet with (1) large patches of living interwoven corals with long sandy channels running through them, the corals consisting of *Tubipora*, *Acropora*, *Pocillopora*, *Goniastrea*, *Seriatopora*, and *Porites*, while large circular *Porites* also occur and are the only solid corals to be met with, the branching forms crumbling beneath one's feet; (2) sparse patches of corals of the same genera, but which may be easily overturned; (3) a white muddy zone; (4) the beach, with its carinated bivalve shells, *Cardium (Fragum) fragum*, and coral fragments.

The lagoon with its marine life provided an inexhaustible field for study. On leaving the beach at low tide probably the first animal to attract the attention of the marine zoologist is the marine geophycean worm, apparently the same species as that described as *Pseudobonellia biuterina* by Johnston and Tiegs (1919) from Masthead and North-west Islets. These animals occurred abundantly in a little sheltered bay near our camp where there were small coral fragments for them to hide under, or else their bodies would be hidden in the sand. From such shelter each would exert a long black proboscis, bifid at the end. The same coral fragment would shelter quite a number of individuals, and the proboscides could be seen radiating out in all directions. About 300 yards from the shore, patches of coral occurred, though isolated clumps existed quite close inshore. A very common coral was *Seriatopora hystrix* with fine branches, pink and white in colour. A small blue and white-banded fish, *Dascyllus aruanus*, frequented the coral, and on a piece being broken off remained in the branches rather than forsake the shelter to which it was accustomed. Many tiny crabs and prawns utilised the crevices in the corals, and marine worms armed with tiny siliceous spicules were also encountered in breaking off coral fragments, their poisonous spicules entering the skin and setting up a severe irritation.

The corals, on the whole, were rather disappointing when judged by the pictures taken by Saville Kent of reefs further north, but the large pools beyond the reef crest yielded very fine examples, tabular *Acropora* vieing with branching forms in beauty of design. Browns and yellows were the predominating colours of the corals, with a few purple patches here and there, relieved by an occasional clump of green sea-weed, like tufts of hair. The thick-antlered forms of stag-horn coral at the sides of the reef pools are kept at the same level as the sloping reef-wall by the waves, and grow as flattened pinkish masses

above, the part projecting into the pool being normal in form. These pools provided shelter for numerous forms of animal life, a Hawksbill turtle, *Chelone imbricata*, swimming in one of these coral pools making a charming picture as he swam from under the shelter of a coral bank into the sunlight. In another pool beautiful fish, identified as *Pomacentrids*, swam in the cover of the coral shelves.

Clams, chiefly small ones, occurred among the corals and the wonderful variety of the mantle colouration was noted. Some were black with yellow stripes, others purple, some were dark with blue markings. Mrs. Lowe and I watched a large swimming crab feeding on a clam. It behaved in an almost human manner, plunging its big nippers into the shell and extracting tiny fragments which it would quickly pass into its mouth.

Cones of various kinds were abundant, and Cowries were much sought after by the ladies of the party. The Melon or Bailer shell, *Cymbium flammicum*, was not uncommon on the reef, and a fine example was secured while in the act of laying its large gelatinous egg capsule. This species was also secured and photographed with its egg-capsule by a member of the R.A.O.U. party in 1910.

Holothurians or Beche-de-Mer were represented by several species, and one long and black form occurred in numbers amongst the corals, extending out from under the blocks and scouring the sand with branching tentacles.

Crustacea of every kind and shape occurred in the lagoon among the coral. Large crabs scuttled away at our approach, while some tiny forms remained in the crevices of branches of madrepores collected, and were only detected when they had finally succumbed and turned pink. A fine example of the Painted Spiny Lobster, *Palinurus fasciatus*, was speared by the turtle-hunters in the lagoon, and presented to us. Its green, blue and red colouration make it a very striking object. The shell of a gastropod mollusc, *Turbo speciosus*, yielded a brilliant tropic Hermit Crab, *Dardanus megistos*, reddish in colour, its back ornamented with white spots ringed with blue.

THE FISHES.

The fish-fauna of North-west Islet was found to be rich in species, as well as in individuals, about seventy species having been observed within three weeks by Mr. G. P. Whitley, who has kindly supplied me with the following popular notes on the fishes and has also furnished the detailed account published under his name (*infra*).

"Of the fishes of North-west Islet, perhaps the most attractive were those which lived amongst the coral. Dainty demoiselles, grey, yellow, brown, electric blue, or striped, swam in little schools in the deeper waters of the reef. In stocks of coral, little green gobies (*Paragobiodon echinocephalus*) and blue-striped Pomacentrids (*Dascyllus aruanus*) sought shelter, remaining in the branches even when the coral was removed from the water. Lurking in crevices were myriads of tiny fishes, gobies, cling-fishes, blennies and the like, and large reef-eels (*Gymnothorax*). Another fish, *Amphiprion polymnus*, sheltered amongst some giant sea-anemones which grew beneath certain of the coral blocks.

"With the influx of the tide, Parrot-fishes, 'Morwongs' (*Lethrinus*), and other splendid food-fishes were seen darting quickly through the water; these, when speared, were welcome additions to our rations. Sharks and rays came over the reef-crest and patrolled the inshore waters at high tide. Several man-eaters were seen, but they evaded such hooks as were baited to lure them. Spotted Cat-sharks (*Chiloscyllium ocellatum*) were very common amongst the coral; they groped half-blindly along the bottom searching for food and when

touched made no attempt to escape. Their golden horny egg-shells were sometimes found cast upon the beaches. Garfish, whiting, silver-bellies, and other small fishes swarmed in the sandy shallows, whilst Sucker-fishes (*Echeneis naucrates*) did most of the scavenging, eating the offal of the turtles, dead fish, etc., and apparently relishing a curious stone-like crab (*Calappa hepatica*).

"Outside the reef, larger fishes were encountered, some of which were caught by trailing a line from a launch. Coral Cod (*Plectropoma maculatum leopardus*) were caught in this way, also the Barred Spanish Mackerel or Leaping Tuna (*Scomberomorus commersonii*), a fine fighter, which grows to a length of six feet and attains at least thirty pounds in weight. Another common outside fish was the Skipjack or Long Tom, a species of *Tylosurus*, which leapt out of the water, or skimmed almost vertically through it, like a shining green snake. Flying fish, too, were abundant and a mullet, perhaps frightened by a porpoise, obligingly jumped onto the deck of our launch. Shoals of Sprats (*Stolephorus robustus*) and Anchovies (*Engraulis australis*) were attacked by the Noddies and Mutton-birds. The Reef Herons confined their fishing activities to the reef."

TURTLES.

Plate xxvii., fig. 1, 2.

The islet with its sandy beaches affords an ideal situation for turtles to make their nests and lay their eggs, and every year hundreds of the chelonians come ashore. The same state of affairs prevails at the other islands of the group, but a turtle-soup canning factory has been established on North-west Islet for many years, and, though the industry has been subject to various vicissitudes, the factory is now in full swing and heavy toll is being taken of the female Green turtles. Three species of turtle visit the islet, the Loggerhead (*Thalassochelys caretta*), the Hawksbill or Shellback (*Chelone imbricata*), and the Green or Greenback (*Chelone mydas*), and of these the lastnamed is by far the most abundant, though all three occur in tropical and subtropical seas throughout the world. The Loggerhead is of no commercial value, but the Hawksbill furnishes the Tortoise-shell of commerce, while from the Green turtle is produced the famous turtle-soup and the by-products, calipash and calipee.

Dr. W. MacGillivray has drawn my attention to the definition of the terms calipash and calipee as they appear in Webster's Dictionary, and has pointed out that on North-west Islet they do not appear to have been correctly applied. In the dictionary the definitions are as follows:—"Calipash. A part of a turtle which is next to the upper shell. It contains a fatty and gelatinous substance of a dull greenish tinge, esteemed as a delicacy. Calipee. A part of a turtle which is attached to the lower shell. It contains a fatty and gelatinous substance of a light yellowish colour much esteemed as a delicacy."

On the islet the turtle-hunters used the term "calipash" for the flesh near the plastron or lower shell, and "calipee" for the flesh of the flippers.

Every night during our stay at the islet about 30 to 40 female Green turtles would come ashore to lay their eggs. Their paths up the beach to the margin of the scrub where they excavate their nests were indicated by broad scalloped tracks. These tracks serve to indicate their whereabouts to the turtle-hunters, who nightly patrol the beach turning on their backs all the turtles they encounter. In this position the animals are helpless, and are left with waving flippers churning up the sand, until ready to be butchered. Their plight as they lay with drooping heads, and eyes bloodshot and exuding long trails of mucus aroused our pity, and some of the ladies tried to ease their sufferings by pouring water over them or placing wet bags on their plastrons.

Before killing operations commenced we experienced the joys of riding to the water those females who had finished egg-laying. A female turtle, though a heavy creature weighing about three and a half hundredweight, seems to experience little difficulty in carrying a rider down to the water's edge.

A detailed account of the turtles of North-west Islet may be seen in The Australian Museum Magazine, Vol. 2, No. 10.

THE VEGETATION.

Plate xxviii.

The plants of North-west Islet are similar in most respects to those occurring on Masthead Island (1) and other islands of the Capricorn Group. During my visit I collected a few of the more conspicuous plants, which were later identified for me by Mr. C. T. White, the Government Botanist of Queensland. A more complete collection was made by Dr. W. MacGillivray, and a list of the plants, together with notes made by him is subjoined.

From just above high-water mark, the vegetation extends back towards the centre of the island, and forms two well-defined zones or associations. In that zone nearest the sea and just above the reach of the highest tides, we find that the Beach Oak (*Casuarina equisetifolia*) is the most conspicuous plant growing in the sandy soil. Here the Green turtles come to lay their eggs, frequently encountering its roots as they sink their egg-pits. Other plants also occur in this zone, and the Goat's-foot *Convolvulus* (*Ipomaea pes-caprae*) a widely distributed tropical plant whose curiously-shaped leaves have given rise to its vernacular name, occurs commonly along the strand. In fact, the plants which frequent the sandy soil near the beaches on these tropic islets are frequently grouped under the heading of a "pes-caprae association."

Another inhabitant of this zone is the *Tournefortia argentea*, a tall shrub or small tree with red-brown trunk, light silvery-green leaves and yellow-green fruit. The trunks are twisted, and the leaves for the most part grow from the ends of the branches in clusters directed upwards. On North-west Islet the leaves are much subject to the attacks of grasshoppers, and many of the trees were almost defoliated. Dodder-like vines hang from their branches and mat the topmost boughs. These small trees are much sought after by Reef-herons as nesting sites, and the young on leaving the rough platform of sticks which serves as a nest, scramble onto the tree-top by means of the vines and there await the parents. In the shelter of the straggling boughs on the ground, Silver Gulls make their grass nests and rear their young. It is the most conspicuous plant between the *Casuarina* and *Pisonia* zones.

Scaevola koenigii, a shrub with large, shining yellow-green leaves grew commonly in this zone and was flowering on the occasion of our visit, the flowers attracting numbers of Sphegid and Psammocharid wasps.

Among the *Tournefortia* and *Scaevola* bushes near our camp grew an obnoxious plant, *Achyranthes aspera*, its seeds adhering readily to one's clothes. The seeds grow along the stems of the plant and are easily detachable. From the top of each seed two curved hooks extend two-thirds the length of the seed, serving to anchor it firmly to one's clothing.

Along the south-eastern side of the island grow numbers of *Pandanus* or Screw-pine, forming in places dense groves. The buttressed stems, saw-like

(1) Longman. Plants of Masthead Island. Proc. Roy. Soc. Q'land, xxv., 1914, 17-23.

leaves and heavy green or ripe-yellow fruits, render these palm-like trees conspicuous among the other forms of beach flora.

On Wilson Island, not far away, the other members of the party found the *Pandanus* to be the dominant plant of that island, even the *Pisonias* taking a second place in importance.

THE PISONIA FOREST.

Plate xxix.

The most conspicuous plant of the second zone or plant association on North-west Island is *Pisonia brunoniana*. In association with it occur other plants such as figs of several kinds, *Pipturus argenteus*, a tall shrub with silvery undersurfaces to its leaves; *Celtis paniculata*, a tall tree with dark green leaves and rather similar in appearance to a Kurrajong; and vines of various kinds. The *Pisonia* trees with their almost flesh-coloured trunks and light-green leaves dominate the surrounding vegetation, many rising to a height of over 40 feet and presenting a wall of verdure when viewed from the reef-crest or the sea. On the northern and southern ends of the island the *Pisonias* come down to the water's edge and their boughs may project over the beach. Here, owing to the winds, their trunks are twisted so that they assume fantastic shapes. Inland, the trunks are straighter and may measure some feet in diameter. Though very stout in appearance they are really extremely soft, and when cut with an axe yield a surprising amount of moisture. The boughs are very brittle and snap if any pressure be put upon them. They are favoured as nesting sites by the White-capped Noddy Tern, and the leaves are used in the construction of the nests. The *Pisonia* is widely distributed over the other islands of the Capricorn Group and extends onto the mainland. It owes its widespread dispersal to the nature of its seeds, which are extremely sticky, adhering readily to the feathers of birds. The seeds grow in clusters, and each seed is cylindrical and ridged. These ripe clusters fall to the ground where, if they come in contact with the feathers of a bird, they cling so closely that any efforts on the part of the bird to dislodge them only results in the seeds becoming more firmly affixed. Mr. Gilbert of our party, one day, when in the company of Dr. MacGillivray and myself, found a White-capped Noddy so covered with bunches of *Pisonia* seeds that it was unable to fly, and merely hopped along the ground. The wings and feathers were bedraggled and seed clogged. It would have ultimately succumbed from starvation, so it was mercifully killed.

Some seeds collected from the Noddy Tern and submitted by the writer to Mr. Cheel, of the Herbarium, Botanic Gardens, Sydney, were identified by him as those of *Pisonia aculeata*, which is a climbing form. Seeds taken from a tree by Mr. Gilbert and sent to Mr. Cheel proved to be identical with those adhering to the Noddy. Leaves of a *Pisonia* were collected by Dr. MacGillivray (see list) and identified by Mr. White as *P. brunoniana*. As the seeds of the species are very dissimilar it would appear that two species of *Pisonia* occur on the islet, though Dr. MacGillivray informs me that he saw no "climber" beyond those given in his list.

While camped at North-west Islet, members of the party made one-day excursions to Tryon and Wilson Islets. Wilson Islet was visited on Thursday, 3rd December, 1925. I did not join the party, but Mr. Whitley, who was a member of it, has kindly provided me with the following account.

WILSON ISLET.

"On December 3rd, a party went in one of Christopher Poulson's launches to Wilson Islet, 13 miles from North-west. After passing the edge of the coral reef, porpoises, basking turtles and pelagic fish were seen. A hook was baited with red rag and towed behind the boat, and a fine Coral Cod (*Plectropoma maculatum leopardus*) was soon caught and lay flapping about on the deck, its colours changing every minute in a series of light and dark pearl grey flushes. Its body and fins were covered with small bright blue spots. The next fish hooked must have been a monster for it nearly pulled a man overboard, but it broke the line and escaped. A large Barred Spanish Mackerel or Leaping Tuna (*Scomberomorus commersonii*) was safely landed, after fighting well and leaping several feet out of the water. Miss Chase netted a few small brown medusae amongst the plankton which drifted past the vessel. At noon, we landed on the beach of Wilson Islet. The beach was heaped up by the surf, which was heavier there than at North-west Islet, and strewn with weathered lumps of coral. The dominant tree was *Pandanus*, *Pisonia* being scarce, but otherwise the flora resembled that of North-west Islet. Cicadas were plentiful in the Casuarinas.

"On the beach in the pitiless glare of the sun, two species of Terns were nesting in little pebble-strewn hollows amongst the larger coral blocks. The noise made as hundreds of them flew overhead was almost exactly like that of a cartwheel which needs oiling. Eggs, white with light blue and brown blotches, were present in some of the nests, together with chicks. One of the latter was yellowish-brown dorsally, whitish on the sides. A few flecks of dark brownish on median line of back near shoulder and others on wings. The beak was white-tipped, otherwise pinkish-brown. Eye dark. Feet and legs pink. It was breathing rapidly in the intense heat, and, though apparently very young, instinctively scuttled into the shade of the nearest stone. Other chicks were prostrated with the heat, but they revived later, according to Mr. O. Webb. A chick, presumably of another species, photographed by Miss Geissmann, was dove-grey and white in colour, with dark grey markings on head and wings. Beak and feet black. (Specimen in Aust. Mus.).

"Sea eagles and Reef Herons were present in the trees on Wilson Islet.

"In places, as at North-west Islet, rocks jut out into the water from the beach. Many are formed of coral and shells conglomerated together and presenting the appearance of polished fossils *en bloc*. The reef yielded many beautiful shells and the vivid blue starfish, *Linckia pacifica*. A few small fishes were collected in the rock-pools, as were also crabs and young specimens of the common black beche-de-mer.

"Inland, the ground was strewn with the serrated leaves of the omnipresent *Pandanus*, and search for animals only revealed isopods, ants, a young cricket and some spiders. A dead Wedge-tailed Petrel and the head of a Skipjack or Long-tom (*Tylosurus*), both probably killed by sea-eagles, were also found."

TRYON ISLET.

Tryon Islet, a densely wooded island, lying five miles to the north-east of North-west Islet, was visited by a party on the 13th December. They found the vegetation similar to North-west Islet, but the shores were steeper and many turtles had died there. Gulls and Brown-winged Terns were found breeding.

THE BIOLOGY OF NORTH-WEST ISLET, CAPRICORN GROUP.

(B.). BIRDS.

By P. A. GILBERT.

Plates xxx.-xxxii.

The Capricorn waters support a vast assemblage of sea-birds and migrants. Indeed, the population of Wedge-tailed Shearwaters can be reckoned at three millions without fear of an over-estimation, while an effort to calculate the number of White-capped Noddies may reasonably place them at one and a half millions. The Crested, Bridled, Roseate, and Black-naped Terns could be computed in tens of thousands, Silver Gulls and Reef Herons by the thousands, with migrants and others in hundreds. This rough computation is given to afford an idea of the relative proportions of the bird population.

Many of the species observed were common to all the islands visited, but in several instances individual kinds selected a special island to nest on, and by sheer force of numbers ousted other species with more or less similar habits from that particular region. On North-west Islet the Wedge-tailed Shearwaters and White-capped Noddies held full sway, their numbers being so dense that Silver Gulls and Reef Herons were compelled to occupy limited sites on the outskirts. Tryon Islet sustained a mixed population of Shearwaters, Bridled Terns, Silver Gulls, and Reef Herons. Wilson Islet was inhabited by the beautiful Roseate and Black-naped Terns in strength, and a small party of Crested Terns, while Masthead Islet was the rendezvous of a colony of Crested Terns.* It will be noticed how the various species of Terns resort to separate islands to congregate and nest, with the exception of Wilson Islet, which harboured three species. Here the favoured sites of the Roseate and Black-naped Terns co-existed, and their habits being somewhat alike their movements were in harmony. The regions of the Capricorns were especially rich in Tern life; nine species being identified of the eighteen on the Australian list, five of which were breeding.

A prodigious amount of fish life must be required to feed this huge concourse of sea-birds. Not only do the adult birds have to satisfy their own appetites, but they also have to meet the never ceasing demands of their insatiable young. Add to this the toll taken by deep sea enemies, and we can get a faint notion of the density of fry which is necessary to maintain this mighty interdependence of life. Further, the continual attacks of piscivorous birds must act as powerful selective factors in shaping new species of fish.

An amazing sense of direction was displayed by all species of birds which travelled to and from, passed by, or dwelt on North-west Islet. Plovers would arrive at low tide, hastily feed among the coral stones and sea-weed, then with a chorus of whistles which signalled their agreement to move on, they rose a few feet, skimmed over the surface of the water and flew to other feeding grounds. Other migrants tarried the full duration of time, which the tide took

*Reported by Mr. Stanley, of the Barrier Reef Committee, who landed on N.W.I. from H.M.S. Moresby during our sojourn.

to recede and rise. At night many inspiring moments were spent on the coral beach. When the air was perfectly still we often heard the calls from flocks of birds as they flew overhead, each giving the other the password so that each knew the whereabouts of the other, and whither all were going.

What impelled these feathered mariners to set sail and shape a course in the blackness of night? Surely they possessed an extraordinary memory for distance and location. How easily the conscious human loses his way without the aid of a compass. Yet these valiant nightfliers were only concerned about the welfare of their mates, as they all knew whither they were bound. A close study of the Wedge-tailed Shearwaters also revealed a singular sense of direction. One stood with amazement while these strange birds silently regulated their direction in the gloom of early night. On their nightly return to North-west Islet they assembled on the wing near the points used as exits for departure in the early morning. After circling round for some considerable time to get their bearings, they flew with certitude over the *Pisonia* forest, each bird dropping beneath its canopy on suspended wings almost at the entrance to its burrow. Experiments with White-capped Noddies also yielded some interesting evidence with regard to the sense of location. From several nests I exchanged white eggs for some heavily blotched ones to see the effect on the sitters. The sitting birds took no notice of the changes whatever, and settled on the strange eggs without hesitation. I then removed their nests and eggs to different positions on the same bough, but when the birds returned they were completely lost, and flew about in a most bewildered manner. I particularly observed these birds to find out whether they could recognise their own eggs, as many suppose that the multitudinous types and variations in the markings are used as a means of recognition. The behaviour of the White-capped Noddies convinced me that they have a wonderful sense of location and direction, but no power of discrimination so far as the colouration of eggs is concerned.

Although the Shearwaters greatly outnumbered the Noddies, well-balanced relations existed between the two species with regard to their departure from or arrival at the islet. The Shearwaters moved out to sea before daybreak and returned after sunset. The first of the Noddies usually streamed out in the first gleam of daylight, and the last of them returned to the trees as the sun set. If it should happen that these birds left together the turmoil would result in disaster for both species, as the resolute sallies of the White-capped Noddies could never harmonise with the swallow-like flight of the Wedge-tailed Shearwaters. This is a marvellous instance of two prolific species adapting themselves to a circumscribed area for breeding purposes. The Shearwaters were so dense that they occupied almost every foot of ground to burrow in. The Noddies were so numerous that they had possession of nearly every branch of every tree on which to place their nests.

The most remarkable feature about the Wedge-tailed Shearwaters was their manner of wooing. They assembled in parties of thirty or forty, on bare patches of ground among the *Pisonia* trees. In the moonlight a rather quaint spectacle was presented by these birds going from one to the other in search of a mate. The male appeared to be the most active in this respect; his methods of courtship were somewhat curious judged in comparison with other avian ceremonies. He caressingly placed his head alongside that of the female and began a low wailing song, which was rendered in varying intonations. He then changed it to purrs, often his notes sounded like the whimpers of a child, or the bleats of a lamb. Should the female show the least signs of responsive-

ness, he would indulge in a series of plaintive pleading murmurs, which usually terminated in an emotional howl similar to that of the domestic cat. Sometimes the female rejected these overtures, and waddled to a male near-by. If she accepted him they began to burrow side by side. The male inflated his throat as he uttered his mournful notes, the greatest distension being reached as the final howl was produced.

There were probably two million Shearwaters courting and burrowing on North-west Islet. The medley created by their strange songs is not readily forgotten. From afar the calls came to one's ears in a confused din and clamour, close by the sense of hearing segregated the various notes of the agonising cat-calls. This was augmented by outbursts of chattering, croaking, and rattling notes from the White-capped Noddies, with the intermittent crows of domestic cocks in a feral state as counter melody. This pandemonium continued throughout the night till three o'clock, when signs of restlessness were evident among the courting birds. In the waning moonlight, half staringly, half gropingly, they moved from their trysting places, and made for the numerous branching tracks which took them to the main tracks leading to the edge of the islet through avenues of tangled *Pisonia* trees. At the edge of the islet clear open spaces worn bare of vegetation by continual traffic accommodated a couple of hundred birds. Here final caressings took place. Generally an inclined lane, shoot, or take-off served as an exit from these assembly grounds to the flood tide bank, along or down which the birds ran a few paces to rise on the wing and pass out seaward.

The ramifications of these main tracks converge from all points on the islet. Each track may be likened to a river with its tributaries and their many streamlets. The main tracks were solid and one could walk with ease along them. Thirty or more of these main tracks radiated from the centre of the islet, and poured out the Shearwaters in continuous streams from three o'clock till half past four in the morning, then gradually decreasing numbers of laggards departed. As these birds moved along the main tracks in close formation of eight or ten abreast, it presented one of the most fascinating pageants of bird masses. While this enthralling display was in progress, many birds gave forth subdued howls, others whimpered, some crooned. Often two birds would begin to fight, temporarily holding up the procession. The birds in the rear became very turbulent, then, after much howling, order was restored, and the gap in the ranks closed up.

From dusk till after eight o'clock the Shearwaters returned to North-west Islet in an unbroken flock, and flew so close together that oftentimes they hit each other with their wings. Their point of arrival was usually high and well over the *Pisonia* trees, but occasionally when a stiff north-easter blew they skimmed over the sea till the forest was reached. They then swept over the tree tops, and flopped beneath the canopy of vegetation. Once they were noticed approaching the islet in long lines closely packed together from four to twelve or more deep. Various calls and notes were uttered while on the wing. It was an extremely interesting experience to be seated in the thick of the jungle about half past seven at night, just as the moon rose and threw its silvery light into the open patches. At this time the Shearwaters dropped towards the ground in thousands. They circled about till they located their burrows or courting grounds, then on poised wings they lowered themselves and hit the soft ground with a thud. Everywhere the quaint dark forms could be seen anxiously groping about for their meeting places.

Many Wedge-tailed Shearwaters were infected with a mucous discharge similar to roup in domestic fowls. I procured one of these diseased birds for Miss E. Chase, of the Sydney University, to dissect. Her examination disclosed that the lungs were ulcerated. This infection rendered the birds helpless on the wing, although when liberated on the water they paddled away freely, but every now and then made fruitless efforts to rise. Many dead birds lay strewn about the beach. These were probably infected birds which had succumbed on the high seas and drifted in with the tide. Again, numbers were too weak to join the early morning throng, and lingered on the shore line till the White-bellied Sea-eagles swooped down on them. Here we have a telling example of the elimination of the unfit. The more vigorous birds flew out to sea before daylight, and returned after dark, and thus escaped the depredations of the eagles; but the weaklings were offered up on Nature's altar to feed healthy eaglets, which incidentally prevented the contamination of the normal birds. Two species of mallophagous parasites were collected from the diseased Shearwater. On the 26th of November the Shearwaters were at the height of the pairing season, the second week in December they began to lay eggs.

Many nests of the Silver Gull were found, containing two or three eggs (26/11/1925). Later these nests were tenanted by young (5/12/1925). The nests were placed on the ground, a depression being made in the sand, in which strands of dry grass and other materials were put as lining. The most favoured site was at the foot of a *Tournefortia* shrub. Under one of these shrubs three nests were found, two with three eggs and one with two. The gulls were always on the alert, and long before we approached their retreats they gave vent to angry cries. There seemed to be a sentinel continually on the watch. It took up a position at the top of a small tree overlooking the nesting site, and as soon as it gave the alarm the sitting birds left their nests, and these together with other birds close by joined in attacks on the intruders. They were exceptionally fearless, time and again they snapped their bills within inches of our heads.

The Silver Gulls on North-west Islet were possessed of extraordinary cunning, and showed great skill and patience when on a foray among the nests of White-capped Noddies. Repeatedly they hovered and soared hawklike above the communities, awaiting their chances to slip in and steal the eggs. The trees nearest the Gulls' nesting site were particularly pillaged, a quarter of the nests being emptied. The Gulls showed no hesitation in carrying out their raids when the opportune time arrived. Towards midday when the blazing sun made brooding a little irksome for the Noddies, many of them flew out for relief, and, while their forces were thus depleted, the Gulls dashed in.

On the beach the astute Gulls displayed all the attributes of veteran beach-combers. They loitered for hours round the luckless green turtles which had been thrown on their backs on the beach by turtle hunters, waiting for them to be butchered. How unwillingly they moved away as we neared them! How angrily they scolded till we had passed on! During the operations of the turtle factory the Gulls become very fat and lusty, and regarded the undeveloped eggs and scraps of turtle meat strewn about the beach as delicacies well worth attention. Nevertheless the shrewdness of the Silver Gulls was very impressive, and living among them from day to day gave us the opportunity of seeing the many good qualities in these imperious, neatly plumaged birds of the beach. And despite the somewhat ill reputation I have given them, they are exceedingly cleanly as regards their toilet. Every day at low tide small parties were seen

enjoying a wash and a splash in the shallows, after which they retired to the beach and thoroughly groomed themselves.

It would be impossible to accurately estimate the number of White-capped Noddies which inhabited North-west Islet. They were so numerous that one was inclined to say a million or so without going into his method of calculation. In one tree alone Dr. MacGillivray and I counted 143 sitting birds. In the same tree many birds were courting, others were building nests. At the moment of our count the population was 168, which included non-sitting pairs, and males resting by the side of their brooding females. The actual number of birds frequenting this tree would be over three hundred, as the sitting birds must be doubled. This was an average tree. Many trees were observed with the sitting birds so closely packed together, and others incessantly flying in and out, that it was impossible to compute them. Other trees had few occupants. *Pisonia* and Fig-trees were mostly resorted to for nesting in, but another densely foliaged laurel-like tree often sheltered crowded families of this handsome Noddy-tern.

I have never observed a more affectionate bird, unless it be the Dusky Woodswallow. The male Noddy sat by the brooding female for hours, often he preened her feathers, nibbled her beak, and showed many other little signs of affection. Frequently a pair would be confined to a square foot of space, but notwithstanding these cramped conditions, the Noddy regarded it as sacred and promptly ousted any of his kin that ventured within this narrow area. The White-capped Noddies had a pleasing manner in their courtship. They stood side by side on a bough, then nodded and bowed to each other. With open bills they uttered various rattling and croaking notes; the rattling notes were quite characteristic and resembled the noise made by loosely running cogwheels. The croaking notes were more often like those of a frog, but sometimes sounded like the stridulations of insects. One bird would begin to chatter and perform, the other would look and listen, and so each carried on in turn.

The nest is a ragged-looking structure chiefly composed of the broad flimsy leaves of the *Pisonia*. These were placed on a branch and firmly packed together with excreta. A shallow depression was made which just prevented the egg from rolling off. If the birds were suddenly startled they frequently kicked their eggs out, consequently observations had to be made quietly. I examined a thousand or more nests, each of which contained one egg only. Some were pure white, others had fine short streaks, a preponderance were spotted on the larger end, while many contained heavy blotches a third of an inch in diameter. The male shares in the task of incubating the egg. The ceremony attached to relieving each other is a pretty one. The male, presumably, sat alongside his spouse, then with a chuckle he started nibbling her bill; she returned the compliment. Then the female gently raised herself from the egg till it was exposed. Both glanced to see if it was safe, when the female carefully slipped off and allowed the male to settle down on the egg. A little more fondling and the female glided from the tree seaward. One sex fed the other while it was sitting on the egg.

From morning till the close of day the White-capped Noddies brushed over the treetops in an uninterrupted flow to and from the sea. During the day many free from nesting obligations, or replete with food, congregated in flocks of 25 or 50 along the beach. They showed their displeasure at being disturbed by clustering over our heads on the wing. This Noddy is the chief disperser of *Pisonia* seeds. Every day a bird was noted with these viscid and peculiarly

hooked seeds clinging to its plumage. Accompanied by Dr. MacGillivray and Mr. A. Musgrave, I found a bird completely disabled through its feathers becoming inextricably glued together. Several times a gun was discharged, when the Noddies in the vicinity of the report rose from their nests in a cloud, shrieking, chattering, calling, but tranquillity soon overtook them, and with celerity and ease they returned to their nests. The loudness of the cries may be judged by my hearing them when over a mile out at sea. The White-capped Noddies evinced fearlessness in their many attacks on the White-bellied Sea-eagles. On the 26th November new nests, fresh and heavily incubated eggs, and a few young birds were observed. Nine days later the forest was ringing with a decidedly sweet, but subdued, "swee-oo swee-oo," uttered by myriads of chicks a day or two old. Mallophaga were present on this species.

The eyrie of a White-bellied Sea-eagle was located in a *Pisonia* tree forty feet from the ground. This was the permanent habitation of a pair of august old birds. Two healthy eaglets, fully grown, but in immature plumage, with the strength of their parents concealed in their brilliant deeply-set eyes, were surprised as I raised myself above the edge of their home. One, stirred to anger, remonstrated by spreading its wings to their full extent. The other, overcome by the intense heat, rested under a *Pisonia* branch which cast an acceptable shade over part of the huge nest structure.

The nest was composed of the large sticks of *Pisonia*, *Tournefortia* and *Ficus* trees. It measured four feet across, two feet three inches deep in materials, with a depression of four inches. The leaves of the Pandanus Palm, strands of grass, and sprays of *Tournefortia* were used as lining. Innumerable feathers and bones of Wedge-tailed Shearwaters lay strewn about, together with remains of fish, the jaws of a Long-tom being evidence that this Eagle subsisted on a varied diet. Ten wings of Shearwaters were counted on the ground in a heap where the Eagles had regaled themselves.

For a time mystery surrounded the presence of a pair of brown birds on North-west Islet. During the day they were seen soaring aimlessly in the sky, then apparently disappeared, till one day Dr. MacGillivray saw them alight on the eyrie. We then observed that the eaglets left their nest daily for trial flights, and returned after each exercise. Fortunately, it must have been after one of these exertions of the wing that I put up my camera to secure their picture, as I often wondered why these feathered monsters tolerated my unwelcome visit. The nest was infested with Dermestid beetles, which devoured all the leavings of the Eaglets, and thus helped to keep it clean.

The Reef Heron was one of the most interesting forms to observe, its dignified demeanour yielding infinite pleasure. The elegant stateliness of this Heron was never more evident than at high tide, when sometimes as many as fifteen birds gathered to form a party. This graceful band was mostly composed of pure white birds, with three or four greyish-black members, which helped to enhance the beauty of the gathering. They leisurely preened and trimmed their feathers as they rested on some high vantage point, waiting for the tide to run out. These birds were mostly off duty, or those that had finished breeding. A fair proportion of young birds made their presence obvious in these flocks by their inordinate timidity; their tendency, too, to move to the middle of the flock greatly added to the grace of their movements.

As soon as the tide began to fall, the Herons dispersed in families, or individuals. While the lagoon emptied its waters into the sea, they patiently searched its shallow reaches for anything that was offering in the way of food.

The first catch was taken to nestlings which feel the pinch of these enforced long intervals between meals. The Herons seemed to keenly watch the flow of tidal waters, for they wasted no time in making to the outer reefs, where they used the "niggerheads" or coral boulders as look-outs, before they finally settled down to search the coral pools which teemed with small fishes. The feeding grounds were sometimes several miles from their nesting sites. The birds fed singly, except those adults with full grown young, which were attended to by their parents.

During our sojourn, nests with two or three eggs, newly hatched young, nestlings half grown or fully fledged, fledglings which had just left the nest, and young full grown birds were observed. The usual number for a sitting or brood was two eggs or young. All the nests found were built in *Tournefortia*, *Pisonia*, *Ficus*, or bushy laurel-like trees. The height varied from eight to fifteen feet from the ground. The structures were composed of coarse sticks, with lengths of vines, grass, and fine twigs as lining. One nest measured eighteen inches across. I found a nest which was owned by a greyish-black male bird and a female white bird. I assume that the female does most of the brooding, and that the white bird of this pair was the female, as it was more often seen on the nest. The nest was in a Fig-tree surrounded by White-capped Noddies. It contained two eggs from which two dark young emerged. All the pairs of white birds had white young. Both sexes shared in incubation and feeding the young. When the nestlings are disturbed they disgorge whatever food they have in their stomachs, fresh or half digested; probably this serves to lighten them should they anticipate flight, or perhaps to distract the attention of their enemies by an offering of food.

Mainland species were poorly represented on North-west Islet and the adjacent islands. The Pied Bell-magpie lacked the "currawong" call of its continental relations, but its other notes were identical. Miss H. Geissmann located a nest about 50 feet up in a Fig-tree, which contained three fully fledged young. There was no distinction between the warble of the insular form of Silver-eye and the mainland *Zosterops lateralis*. Their habits were alike in every respect, while the location and construction of their nests were the same. The North-west Islet bird appeared to be a trifle lighter in colour than the mainland type, but this may be attributable to the nature of its food, which consisted of a narrow range of fruits, berries, and insects. Several nests were found, most of which had been occupied, one with two eggs, and one with two young. The Bar-shouldered Dove was occasionally seen on the eastern end of the islet, feeding in seed-bearing vines. A pair of White-shouldered Caterpillar-eaters were seen on Wilson Islet. The Sacred Kingfisher was observed on all the islands visited, it was nesting in the trunks of *Pisonias*. Most of the adults were feeding newly hatched young.

The many wandering species of the Plover family yielded endless interest. Every day flocks of these migrants arrived and departed; sometimes the shores at low tide would be crowded with a variety of these birds eagerly feeding among the exposed coral. These mystery birds have caused no end of speculation with regard to their passages over long distances, without food and in the face of adverse conditions. Their inherent knowledge of distance, direction, and location, however, is undoubtedly the result of incalculable ages of struggle and wandering, in which millions of their kind have succumbed to perfect the present generations. Most of the factors in their evolution which have brought about these powers of endurance are now lost to us, and it therefore seems hopeless to

definitely assign the causes which have furnished them with their remarkable instincts.

The active Turnstone was very popular with the bird observers. This robust little fellow especially charmed us with his method of turning over small pieces of dead coral in quest of eatables. To perform this task he raised and pushed the stone at the same time with his upper mandible near the forehead. Then with a sharp jerk he threw the coral clear of the lurking organisms. The Turnstone worked assiduously during low tide, but seemed to vanish when the incoming waters ran half way up the beach. The Lesser Golden Plover was another bird that constantly engaged our attention. It was always present on the beach, and caused much amusement by the skipping way it avoided the ripples of the rising tide. Several parties of Bar-tailed Godwits continually patrolled the beach, often accompanied by little Whimbrels. The Sharp-tailed Stint made occasional visits to the islet in medium flocks, but its stay was very brief. A small band of Oyster-catchers was always conspicuous on the eastern end of the islet.

At low tide from this point the reef was bare for several miles eastward, and over this wide stretch the migrants and sea-birds spread in countless numbers. The habitual cautiousness of the Plover kind required much strategy from observers to enable them to obtain a better understanding of their shy ways. Their presence on North-west Islet was ostensibly to feed, and, while they seemingly concentrated on the pursuit of food, they incidentally preserved a vigilance that sorely tried the patience of stalkers who essayed to secure their pictures.

WILSON ISLET.

Our trip to Wilson Island was a profitable and interesting one. When our launch was midway between Tryon and North-west Islet, we ran through a small flock of Little Terns shepherding a shoal of fish. They dived for a catch, rose, swallowed it on the wing, wheeled in a half circle, and then repeated the movements. Later we passed an immense body of White-capped Noddies which churned the sea with their continual plunges at a swiftly moving school. Bridled and Crested Terns were also observed sharing the spoils. As we approached Wilson Islet, the Little Terns became more plentiful. No records of their nesting were obtained; probably they would resort to this islet later in the season.

This lonely outpost was the home and refuge of many birds. When we were about to land, a party of Reef Herons, twelve white and one dark, rose in unison from a *Casuarina* on the southern end, and with a graceful sweep flew round the islet to avoid us. Silver Gulls and Crested Terns greeted us from the northern beach, where the latter occupied a small corner for nesting. This picturesque islet was overgrown with Pandanus palms above which a Fig-tree or two and several *Pisonias* thrust their leafy tops. Near the shore line luxuriant *Tournefortias* and the widely distributed *Casuarina equestifolia* had a footing. Several species of grass and other herbaceous growths were noted. The lean of the vegetation northward indicated that Wilson Islet received the full force of southerly gales, while further evidence was afforded by a rugged outcrop of coral rock which formed a miniature breakwater on the southern end, with no intervening beach between it and the vegetation. The western shore was steep and irregular; a few Green-backed turtles had left their trails here. On the eastern shore there was a wide area of coral boulders, stones, shingles, gravel, and sand. This coarse coral rock spread over the higher ledge for a couple of acres, and was occupied by Roseate Terns. This area seemed to be permanently above high water mark, as numerous small creepers trailed on the ground, while

young *Tournefortias* and other herbage flourished, which appeared destined to enlarge the vegetation-bearing area of the islet. A lower ledge of shingles and stones extended from this site in a curved narrow belt to the southern end, and was in the possession of the Black-naped Terns.

Dr. MacGillivray and I made our way round the southern end and immediately stepped into the nesting region of the Black-naped Terns. The rest of the party went round the northern end and flushed the Roseate Terns from their nests. With startled calls they rose from their eggs and intermingled. There was a slight difference in their cries of alarm. It was a beautiful sight to look up at these two species commingled in a dense flock just overhead. Many birds hovered and fluttered quite low with their heads pointed towards their nests, while their feet hung down with outspread toes and distended webs. The brilliant red feet, and dark-reddish bills of the Roseate Terns, and the glossy black feet and blackish bills of the Black-naped Terns helped to make a contrast of indescribable beauty. Slowly they separated, the elegant Roseate retired to the boulders, the dainty Black-naped to the shingles.

The Black-naped Terns usually constructed their nests near small pieces of coral stone. Numerous coral pebbles and fragments of sea shells were gathered and arranged between these stones to form a receptacle for the eggs. The nests were all built on the lower ledge, and were so close together in places that it was necessary to look before each step lest one should tread on the eggs. Seven nests were counted in a square yard. The eggs were extremely difficult to see as their light colour harmonised with the white background on which they rested. Many of the nests contained only one egg, others had two, heavily incubated, but I have no record of the young of this species being observed. The Black-naped Terns' eggs were easily distinguishable from those of the Roseates by their less pointed shape, lighter colour, and small markings, which often formed a well-defined zone on the larger end.

The Roseate Terns were more abundant and possessed a greater nesting area than the Black-naped species. They chiefly resorted to the higher ledge, which was composed of the coarse coral. Their nests were placed under small shrubs, near large stones, by the side of tussocks of grass, in bunches of creepers, or among gravel. All the sites that offered shelter from the sweltering sun were availed of, two nests being found under some of the plants. Most of the nests examined contained two eggs, several had three, while an occasional single egg was seen. Many young were observed, a number had just hatched, others were half grown. When disturbed scores of young scrambled from their retreats and quickly made their way to the *Pandanus* jungle for shelter from the blazing sun, the adult birds fluttering by, urging and directing them. The young varied in colour from a spotless creamy white to a dull brown, heavily mottled and streaked with much darker markings. We visited Wilson Islet on the 3rd of December.

I append a list of the species observed in the Capricorn Group. Several other species were seen, but some doubt existing as to the exact identification, they are omitted. This region being a sanctuary, no skins were taken for identification purposes. I am greatly indebted to Dr. W. MacGillivray for the assistance he gave me in identifying many of the species, and also for my references to Tryon Islet; indeed, his wide experience of the Avifauna of the Great Barrier Reef was drawn upon by all members of the party interested in birds.

LIST OF BIRDS OBSERVED.

Note: The synonymy has been revised by Mr. Tom Iredale, who has also added the notes in square brackets [].

Order PROCELLARIIFORMES.

THYELLODROMA PACIFICA, Wedge-tailed Shearwater.

Procellaria pacifica Gmelin, Syst. Nat., Vol. i., pt. ii., 1789, 560. Pacific Ocean = Kermadec Islands.

Puffinus pacificus Mathews, Birds Austr., ii., 1912, pl. 75.

Thyelodroma pacifica Mathews & Iredale, Austral Av. Rec., iv., 1920, 67. Manual Birds Austr., i., 1921, 26.

[The East Australian form was named *Puffinus pacificus royanus* by Mathews, Birds Austr., iii., 1912, 85, the type being a specimen from Sydney; the characters assigned were horncoloured, small bill, short wings and tail. A specimen found dead or dying by Miss E. Chase, of the University of Sydney, has the bill marked as black, the legs bluish-white, but it has a very small bill, short wings and tail].

North-west, Tryon and Wilson Islets.

Order FREGATI.

FREGATA MINOR, Frigate Bird.

Pelecanus minor Gmelin, Syst. Nat. i., ii., 1789, 572. West Indian Seas = Jamaica.

Fregata minor Mathews, Birds Austr., iv., 1915, pl. 229.

Fregata minor Mathews & Iredale, Austral Av. Rec., iv., 1920, 68. Manual Birds Austr., i., 1921, 58.

[Two species of Frigate Bird are known from North Queensland, and the determination of the species occurring so far south would have been valuable. It may be noted that the form of the larger (the present) species occurring at Torres Strait has been named *Fregata minor peninsulæ* Mathews (Bull. Brit. Orn. Club, 44, 1923, 16), and *F. m. mathewsi* by Lowe].

Masthead I., reported by Mr. Stanley, H. M. S. Moresby.

Order PELECANI.

MICROCARBO MELANOLEUCUS, Little Pied Cormorant.

Hydrocorax melanoleucus Vieillot, Nouv. Dict. d'Hist. Nat. nouv. ed., viii., 1817, 88. Australasiae = New South Wales.

Microcarbo melanoleucus melanoleucus Mathews, Birds Austr., iv., 1915, pl. 223, text 189.

Carbo melanoleucus (on pl.))
Microcarbo melanoleucus Mathews & Iredale, Austr. Av. Rec., iv., 1920, 69. Manual Birds Austr., i., 1921, 65, pl. x., fig. 1.

North-west I. reef, Tryon I.

Order LARI.

STERNA DOUGALLII, Roseate Tern.

Sterna dougallii Montagu, Ornith. Diet. Suppl., 1813, no page. Scotland. Mathews, Birds Austr., ii., 1912, pl. 108. Mathews & Iredale, Austral. Av. Rec., iv., 1920, 70. Manual Birds Austr., i., 1921, 87, pl. 5, fig. 3; pl. 3, fig. 6 (nestling); pl. xii., figs. 5-6.

[The Australian subspecies *S. d. gracilis* Gould (P.Z.S., 1845, 76) is well characterised by its paler colouration and long slender bill].

Breeding, Wilson I.

GYGISTERNA SUMATRANA, Black-naped Tern.

Sterna sumatrana Raffles, Trans. Linn. Soc. (Lond.), xiii., 2, 1822, 329. Sumatra.

Sterna melanauchen (on pl.) } Mathews, Birds Austr., ii., 1912, pl. 110, text, p. 370.
Sterna sumatrana }

Gygisterna sumatrana Mathews & Iredale, Austral Av. Rec., iv., 1920, 70. Manual Birds Austr., i., 1921, 88, pl. xiv., figs. 2, 3.

[The Australian form has been named *S. s. kemp*i Mathews (Nov. Zool., xviii., 1912, 210) on account of its longer bill though shorter wing].

Breeding, Wilson I. (Apparently southernmost record).

STERNULA ALBIFRONS, Little Tern.

Sterna albifrons Vroeg., Cat. Rais. d. Ois., Adumb., p. 6, 1764. Europe.

Sterna sinensis (on pl.) } Mathews, Birds Austr., ii., 1912, pl. iii., text, p. 375.
Sternula albifrons }

Mathews & Iredale, Austral Av. Rec., iv., 1920, 70. Manual Birds Austr., i., 1921, 89.

[The East Australian form will bear the name *S. a. placens* Gould (Ann. Mag. Nat. Hist., Ser. iv., Vol. xiii., 1871, 192) named from Torres Strait].

Seas between North-west and Tryon Islets, Wilson Islet.

PELECANOPUS BERGII, Crested Tern.

Sterna bergii Lichtenstein, Verz. doubl. Zool. Mus Berlin, 1823, 80. Cape of Good Hope.

Sterna bergii (on pl.) } Mathews, Birds Austr., ii., 1912, pl. 106, text, p. 340.
Thalasseus bergii }

Mathews & Iredale, Austral Av. Rec., iv. 1920, 70.

Pelecanopus bergii, Mathews & Iredale, Manual Birds Austr., i., 1921, 92, pl. xiv., f. 4.

[Whether the Capricorn bird is referable to the southern (*P. b. poliocercus* Gould, Synopsis Birds Austr., 1837, pl. 37: Tasmania) or northern race *P. b. pelecanoides* King (Survey Intertrop. Coast S. Austr., i., 1826, 422: Torres Strait) was not determined].

North-west, Tryon I., Wilson I., Masthead I.

PELECANOPUS BENGALENSIS, Lesser Crested Tern.

Sterna bengalensis Lesson-Traite, d'Orn., 1831, 621. India.

Sterna media (on pl.) } Mathews, Birds Austr., ii., 1912, pl. 107, text, p. 352.
Thalasseus bengalensis }

Mathews & Iredale, Austral Av. Rec., iv., 1920, 70.

Pelecanopus bengalensis, id., Manual Birds Austr., i., 1921, 93, pl. 3, fig. 5, pl. 4, fig. 1.

[The Australian form is smaller and paler than the typical race and should be called *P. b. torresii* Gould (P.Z.S., 1842, 140, 1843, described from Port Essington, Northern Territory). Mathews named the Cape York form *P. b. robini* (Austral Av. Rec., iii., 1916, 55) and this might be the valid name for the Capricorn birds].

North-west and Wilson Islets.

HYDROPROGNE CASPIA, Caspian Tern.

Sterna caspia Pallas, Nov. Comm. Acad. Sci. Petrop., xiv., 1770, 582. Caspian Sea.

Hydroprogne caspia (on pl.) } Mathews, Birds Austr., ii., 1912, pl. 105, text, p. 333.
Hydroprogne tschegrava }

Hydroprogne caspia Mathews & Iredale, Austral Av. Rec., iv., 1920, 70. Manual Birds Austr., i., 1921, 96, pl. 3, fig. 1, pl. xii., fig. 3, 4.

[Again either the northern or southern forms might have been met with. Gould named the southern form on account of its very large size and powerful bill and the name *H. c. strenuus* Gould (Birds Austr., vii., 1846, pl. 22) can be used for this distinct form. The Cape York bird is smaller in all its measurements, though still much larger than the typical bird and was named *H. c. yorki* by Mathews (Austral Av. Rec., ii., 1915, 125)].

Capricorn waters, near Masthead Islet.

MELANOSTERNA ANAETHETUS, Bridled Tern.

Sterna anaethetus Scopoli, Del. Flor. Fauna Insub., 1786, 92. Philippine Is.

Sterna anaetheta (on pl.)

Melanosterna anaethetus } Mathews, Birds Austr., ii., 1912, pl. 114, text, p. 397.

Mathews & Iredale, Austral Av. Rec., iv., 1920, 70.

Manual Birds Austr., Vol. i., 1921, 97, pl. 3, fig.

13, pl. xx., fig. 9.

[The East Australian bird is recognisable as a subspecies with the name *M. a. novaehollandiae* Stephens (Shaw's Gen. Zool., xiii., pt. i., 1826, 161: New South Wales) being darker and larger than the typical form with a greyer neck, the West Australian form being even darker and has been named *M. a. rogersi* Mathews (Austral Av. Rec., ii., 1915, 126: Admiralty Gulf, North-west Australia)].

Breeding, Tryon Islet.

MEGALOPTERUS MINUTUS, White-capped Noddy.

Anous minutus Boie, Isis, 1844, col. 188. North-east Australia.

Micranous leucocapillus (on pl.) } Mathews, Birds Austr., ii., 1912, pl. 117, text,
Megalopterus minutus } p. 417.

Mathews & Iredale, Austral Av. Rec., iv., 1920,

70. Manual Birds Austr., i., 1921, 100,

pl. 3, fig. 4, pl. xiii., fig. 1, 2, 3.

[This would be the typical subspecies better known under Gould's name *Anous leucocapillus* (P.Z.S., 1845, 103, 1846) described from Raine I., Great Barrier Reef].

Breeding, North-west Islet.

ANOUS STOLIDUS, Noddy.

Sterna stolidus Linné, Syst. Nat., 10th ed., 1758, 137. Atlantic Ocean.

Anous stolidus Mathews, Birds Austr., ii., 1912, 405, pl. 115. Mathews & Iredale,

Austral Av. Rec., iv., 1920, 70. Manual Birds Austr., i., 1921, 102, pl. 3,
fig. 9, pl. xiii., fig. 4, 5.

[Mathews named the East Australian race *A. s. antelius* (Austral Av. Rec., iii., 1918, 159: Cooktown, Q.) as being browner, with lighter head and longer wings than *A. s. gilberti* which he had previously named (Birds Austr., ii., 1912, 405) from West Australia].

Capricorn waters, near Masthead I., North-west I.

BRUCHIGAVIA NOVAEHOLLANDIAE, Silver Gull.

Larus novaehollandiae Stephens, in Shaw's Gen. Zool., xiii., 1, 1826, 196. New South Wales.

- Larus novaehollandiae* (on pl.) } Mathews, Birds Austr., ii., 1912, pl. 120, text,
Bruchigavia novaehollandiae } p. 448.
 Mathews & Iredale, Austral Av. Rec., iv., 1920,
 71. Manual Birds Austr., i., 1921, 106,
 pl. xiv., fig. 5, 6, pl. xv., figs. 1, 4.

[Two subspecies have been recognised from East Australian waters while a very distinct third occurs in Tasmania. The typical form from New South Wales *B. n. novaehollandiae* has a light coral bill with mirrors on the three first primaries, while *B. n. yorki* Mathews (Birds Austr. Suppl., No. 1, Check List, 1920, 30: Torres Strait) is larger with a stouter bill and generally only mirrors on the first two primaries].

Breeding, North-west and Tryon Islets, Wilson Islet.

CATHARACTA LONNBERGI, Antarctic Skua.

- Catharacta antarctica lonnbergi* Mathews, Nov. Zool., xviii., 1912, 212. New Zealand Seas.
Megalestris antarctica (on pl.) } Mathews, Birds Austr., ii., 1913, pl. 122, text,
Catharacta lonnbergi } p. 484.
 Mathews & Iredale, Austral Av. Rec., iv., 1920,
 71. Manual Birds Austr., i., 1921, 110,
 pl. xii., fig. 7, 8.

[It is interesting to note this subantarctic bird goes so far north].

Capricorn waters, near Masthead I.

LIMNOCINCLUS ACUMINATUS, Sharp-tailed Stint.

- Totanus acuminatus* Horsfield, Trans. Linn. Soc. (Lond.), xiii., 1, 1821, 192. Java.
Erolia acuminata (on pl.) } Mathews, Birds Austr., iii., 1913, pl. 161, text. p.
Limnocinclus acuminatus } 255.
 Mathews & Iredale, Austral Av. Rec., iv., 1920, 72.
 Manual Birds Austr., i., 1921, 129, pl. xviii., fig. 10.

North-west I.

HETERACTITIS BREVIPES, Grey-rumped Tattler.

- Totanus brevipes* Vieillot, Nouv. Dict. d'Hist. Nat., nouv. ed., vi., 1816, 410. No loc. = Timor.
Tringa brevipes (on pl.) } Mathews, Birds Austr., iii., 1913, pl. 151, text,
Heteroscelus incanus brevipes } p. 207.
Heteractitis brevipes Mathews & Iredale, Austral Av. Rec., iv., 1920, 72. Manual Birds Austr., i., 1921, 143, pl. xviii., fig. 3.

[Scarcely to be distinguished from this by sight is the Wandering Tattler *H. incanus* Gmelin (Syst. Nat., I., ii., 1789, 658, I. Eimeo, Pacific Ocean) which has also occurred in Torres Strait and may occur down the Great Barrier Reef].

North-west Islet.

VETOLA LAPPONICA, Barred-rumped Godwit.

- Scolopax lapponica* Linné, Syst. Nat., x. ed., 1758, 147. Sweden, Europe.
Limosa baueri (on pl.) } Mathews, Birds Austr., iii., 1913, pl. 148, text 192.
Vetola lapponica } Mathews & Iredale, Austral Av. Rec., iv., 1920, 72.
 Manual Birds Austr., i., 1921, 145, pl. xx., fig. 1, 2.

[The Australian birds are referred to the eastern race *V. l. baueri* Naumann (Vögel Deutschl., viii., 1836, 429: New Holland) separable by the darker rump, more heavily barred flanks and paler colouration].

North-west and Tryon Islets.

MESOSCOLOPAX MINUTUS, Little Whimbrel.

Numenius minutus Gould, P.Z.S. (Lond.), 1840, 176, 1841. New South Wales.

Numenius minutus (on pl.) } Mathews, Birds Austr., iii., 1913, pl. 146, text 180.

Mesoscolopax minutus }

Mathews & Iredale, Austr. Av. Rec., iv., 1920, 73.

Manual Birds Austr., i., 1921, 149, pl. xix.,
fig. 10, 11.

North-west Islet.

PHAEOPUS PHAEOPUS, Whimbrel.

Scolopax phaeopus Linné, Syst. Nat., x. ed., 1758, 146. Europe.

Numenius variegatus (on pl.) } Mathews, Birds Austr., iii., 1913, pl. 145, text

Phaeopus phaeopus variegatus } 176.

Phaeopus phaeopus Mathews & Iredale, Austral Av. Rec., iv., 1920, 73. Manual
Birds Austr., i., 1921, 150, pl. xxiv., fig. 1.

[The Australian birds belong to the eastern subspecies *P. p. variegatus* Scopoli (Del Flor. Faun. Insub., ii., 1786, 92: Luzon), a smaller bird with the rump more barred and axillaries with narrower and closer bars].

North-west Islet.

HAEMATOPUS OSTRALEGUS, Pied Oystercatcher.

Haematopus ostralegus Linné, Syst. Nat., x. ed., 1758, 152. Sweden, Europe.

Haematopus longirostris (on pl.) } Mathews, Birds Austr., iii., 1913, pl. 126,

Haematopus ostralegus longirostris } text 15.

Haematopus ostralegus Mathews & Iredale, Austral Av. Rec., iv., 1920, 74.

Manual Birds Austr., i., 1921, 157, pl. xvi., figs. 1, 2, 3, 4.

[The Australian Pied Oystercatcher was long known as *H. longirostris*, but there may be three subspecies in Australia and these can only be regarded as forms of the European species. Mathews separated the North Queensland bird as *H. l. mattingleyi* (Nov. Zool., xviii., 1912, 213: Cooktown) as being smaller, etc., and this may be the Barrier form].

North-west and Wilson Islets.

HAEMATOPUS UNICOLOR, Black Oystercatcher.

Haematopus unicolor Forster, Descr. Anim. ed. Licht., 1844, 112. New Zealand.

Haematopus niger fuliginosus Mathews, Birds Austr., iii., 1913, 24.

Haematopus unicolor Mathews & Iredale, Austral Av. Rec., iv., 1920, 74. Manual
Birds Austr., i., 1921, 158.

[The South-east Australian race is known as *H. u. fuliginosus* Gould (Birds Austr., pt. xviii. (Vol. iv., pl. 8) 1845: Tasmania) while the Northern Australian race is smaller and has a large bare space round the eye and is called *H. u. ophthalmicus* Castelnau & Ramsay (Proc. Linn. Soc. N.S.W., i., 1877, 385: Gulf of Carpentaria, Queensland)].

Tryon Islet.

ARENARIA INTERPRES, Turnstone.

Tringa interpres Linné, Syst. Nat., x. ed., 1758., 148. Europe.

Morinella interpres Mathews, Birds Austr., iii., 1913, 5, pl. 125.

Arenaria interpres Mathews & Iredale, Austral Av. Rec., iv., 1920, 74. Manual Birds Austr., i., 1921, 159, pl. xix., figs. 8, 9.

[The form of Turnstone that visits Australia is called *A. i. oahuensis* Bloxham (Voy. Blonde Sandwich Is., 1826, 251, 1827: Sandwich Islands) a paler bird than the typical but not as pale as the American race, *A. i. morinella* Linné].

North-west, Tryon and Wilson Islets.

SQUATAROLA SQUATAROLA, Grey Plover.

Tringa squatarola Linné, Syst. Nat., x. ed., 1758, 149. Sweden, Europe.

Squatarola squatarola Mathews, Birds Austr., iii., 1913, 69, pl. 132. Mathews & Iredale, Austral Av. Rec., iv., 1920, 74. Manual Birds Austr., i., 1921, 162, pl. xxii., fig. 6, 7.

[The Australian visitors are referable to the Eastern race *S. s. hypomelus* Pallas (Reise Russ. Reich., iii., 1776, 699: Siberia) separable by means of their larger bills, large size and paler colouration].

North-west and Wilson Islets.

PLUVIALIS DOMINICUS, Lesser Golden Plover.

Charadrius dominicus P.Z.S. Müller, Vollst. Natursyst. Suppl., 1776, 116. St. Domingo, America.

Charadrius fulvus (on pl.) } Mathews, Birds Austr., iii., 1913, pl. 133, text 74.
Pluvialis dominicus fulvus }

Pluvialis dominicus Mathews & Iredale, Austral Av. Rec., iv., 1920, 74. Manual Birds Austr., i., 1921, 163, pl. xxii., fig. 4, 5.

[The Eastern Siberian race *P. d. fulvus* Gmelin (Syst. Nat. I., ii., 1789, 687: Tahiti) which is the form visiting Australia, is a smaller bird than the American race, but with noticeably longer legs and brighter colouration].

North-west, Tryon and Wilson Islets.

Order RALLI.

HYPOTAENIDIA PHILIPPENSIS, Buff-banded Rail.

Rallus philippensis Linné, Syst. Nat. xii. ed., 1766, 263. Philippine Is.

Eulabeornis philippensis Mathews, Birds Austr., i., 1911, pl. 47.

Hypotaenidia philippensis Mathews & Iredale, Austral Av. Rec., iv., 1920, 75. Manual Birds Austr., i., 1921, 194, pl. xxvi., fig. 7, 8.

[This species, with a wide range, shows many subspecies so that the form occurring on the Great Barrier Reef needs investigation. It is most likely to be *H. p. yorkei* named by Mathews (Austral Av. Rec., ii., 1913, 6) from Cape York, Queensland].

Tryon Islet.

Order COLUMBAE.

CHRYSAUCHOENA HUMERALIS, Barred-shouldered Dove.

Columba humeralis Temminck, Trans. Linn. Soc. (Lond.), xiii., 1, 1821. Broad Sound, Queensland.

Geopelia humeralis Mathews, Birds Austr., i., 1911, pl. 31.

Chrysauchoenas humeralis Mathews & Iredale, Austral Av. Rec., iv., 1920, 78.

Manual Birds Austr., i., 1921, 245, pl. xxxiii, fig. 3.

[This would be the typical subspecies].

North-west and Tryon Islets.

Order HERODIONES.

NOTOPHOYX NOVAEHOLLANDIAE, White-fronted Heron.

Ardea novaehollandiae Latham, Index Ornith., ii., 1790, 701. New South Wales.

Notophoyx novaehollandiae Mathews, Birds Austr., iii., 1914, 438, pl. 188.

Mathews & Iredale, Austral Av. Rec., iv., 1920, 81.

North-west and Wilson Islets.

DEMIGRETTE MATOOK, Blue Reef Heron.

Ardea matook Vieillot, Nouv. Dict. d'Hist. Nat., nouv. ed., xiv., 1817, 416.
Queen Charlotte Sound, New Zealand.

Demigretta matook Mathews, Birds Austr., iii., 1914, 450, pl. 191. Mathews
& Iredale, Austral Av. Rec., iv., 1920, 81.

[No consideration of this interesting genus has yielded acceptable results to all. The latest conclusion of Mathews & Iredale is that the Blue and White Reef Herons should be regarded as distinct species, the latter bearing the name *Demigretta greyi* Gould (Bird Austr., pl. xxxiii (Vol. vi., pl. 61) 1848) named from Raine Island, while Mathews named the Australian race of the Blue Reef Heron *D. m. cooktowni* (Nov. Zool., xviii., 1912, 232) from Cooktown, Q., as being paler than extralimital forms].

Breeding, North-west and Tryon Islets, Wilson I.

DUPETOR FLAVICOLLIS, Yellow-necked Mangrove Bittern.

Ardea flavicollis Latham, Index Ornith., ii., 1790, 701. South China.

Ardeiralla gouldi

Dupetor flavicollis Mathews, Birds Austr., iii., 1914, pl. 198, text 479.

Dupetor flavicollis Mathews & Iredale, Austral Av. Rec., iv., 1920, 81.

[Two forms have been distinguished in Eastern Australia: a southern form *D. p. gouldi* Bonaparte (Consp. Gen. Av., ii., 1855, 132: New South Wales) and a northern one *D. f. olivei* Mathews (Nov. Zool., xviii., 1912, 234: Johnston River, Q.), the latter a darker bird throughout].

North-west Islet.

Order FALCONES.

CUNCUMA LEUCOGASTER, White-bellied Sea Eagle.

Falco leucogaster Gmelin, Syst. Nat. I., i., 1788, 257. Loc. unk. = New South Wales.

Haliaeetus leucogaster } Mathews, Birds Austr., iv., 1915, pl. 243, text 133.
Cuncuma leucogaster }

Cuncuma leucogaster Mathews & Iredale, Austral Av. Rec., iv., 1920, 83.

Breeding, North-west I., Tryon and Wilson Islets.

Order HALCYONES.

SAUROPATIS SANCTA, Sacred Kingfisher.

Halcyon sanctus Vigors & Horsfield, Trans. Linn. Soc. (Lond.), xv., 1827, 206.
New South Wales.

Sauropatis sancta Mathews, Birds Austr., vii., 1918, 180, pl. 339.

Sauropatis sancta Mathews & Iredale, Austral Av. Rec., iv., 1920, 89.

[The North Queensland form has been separated as *S. s. confusa* Mathews (Nov. Zool., xviii., 1912, 289: Cooktown, Q.) as being smaller with a longer bill, but otherwise not differing in colouration from the southern race].

Breeding, North-west, Tryon and Wilson Islets.

Order PASSERES.

LALAGE TRICOLOR, Caterpillar-eater.

Ceblepyris tricolor Swainson, Zool. Journ. I., 1825, 467. Australia = Sydney,
New South Wales.

Lalage tricolor Mathews & Iredale, Austral Av. Rec., iv., 1920, 495. Mathews,
Birds Austr., ix., 1921, pl. 418.

Wilson Islet.

STREPERA GRACULINA, Pied Crow-Shrike.

Corvus graculinus White, Journ. Voy. N.S.W., 1790, 251. Sydney, N.S.W.

Strepera graculina Mathews & Iredale, Austral Av. Rec., iv., 1920, 100.

Strepera graculina Mathews, Birds Austr., x., 1923, 488.

[The birds from North Australia are regarded as subspecifically separable; the form from Johnstone River, Queensland, having been named *S. g. robinsoni* by Mathews (Nov. Zool., xviii., 1912, 443) so that the Capricorn bird might very easily differ from that as well as from the typical race from Sydney].

Breeding, North-west Islet.

ZOSTEROPS LATERALIS, White Eye.

Sylvia lateralis Latham, Index Ornith. Suppl., 1801, p. lv. Sydney, New South
Wales.

Zosterops lateralis Mathews & Iredale, Austral Av. Rec., iv., 1920, 101.

Zosterops lateralis Mathews, Birds, Austr., xi., 1923, pl. 505.

[This interesting bird shows variation which is not yet understood. The Capricorn breeding bird was named *Z. chlorocephalus* by Campbell & S. A. White (Emu, x., 1910, 196) and the specimens collected by those workers certainly differed, but no series has since been procured. The smaller form *Z. ramsayi* Masters (Proc. Linn. Soc. N.S.W. I., 1876, 56), from Palm Island, Halifax Bay, not Torres Straits, is quite separable].

North-west and Tryon Islets, breeding: Wilson Islet.

THE BIOLOGY OF NORTH-WEST ISLET, CAPRICORN GROUP.

(C.). FISHES.

By GILBERT P. WHITLEY, Australian Museum, Sydney.

(By permission of the Trustees of the Australian Museum.)

Plates xxxiii. and xxxiv.

During a holiday spent as a member of Mr. E. F. Pollock's party on North-west Islet, I was able to make a collection of fishes, thanks largely to the kindly help rendered by the turtle-hunters and members of the camping party, comprising about sixty per cent. of the numerous species observed there. Only those species of which specimens were secured are recorded in this paper. There is no freshwater on North-west Islet, and all the fishes were taken on or near the coral reefs there.

In compiling the following list, I have received material help from the card-index to Australian ichthyological literature made by the late Mr. Allan R. McCulloch, whilst Mr. T. Iredale has given helpful advice concerning taxonomy and early systematic literature.

Carcharhinus stevensi Ogilby, *C. melanopterus* Quoy & Gaimard, *Rhynchobatus djiddensis* Forskal, *Dasyatis kuhlii* Müller & Henle, *Lutianus amabilis* De Vis, *Gymnocranius audleyi* Ogilby, *Scorpaena grandisquamis* Ogilby, *Choerodon venustus* De Vis, *Paragobiodon echinocephalus* Rüppell, *Gobiodon verticalis* Alleyne & Macleay, *Echeneis naucrates* Linnaeus, and *Lepadichthys frenatus* Waite are the only fishes recorded from North-west Islet in various papers by Ogilby and McCulloch (1).

Family ORECTOLOBIDAE.

CHILOSCYLLIUM PUNCTATUM.

Chiloscyllium punctatum Müller & Henle, Plagios., 1841, 18, pl. iii. Java.

An ovigerous female, 885 mm. in total length, was greyish-brown above, lighter below, lacking spots or bars.

Egg.—Each oviduct of this specimen contained an egg, one of which measured 96 x 47 mm. Shell golden-brown, coated with golden silky fibres, forming a lateral loop as described and figured by Ogilby and McCulloch (2). A smaller egg-case, shining dark brown interiorly, 77 x 33 mm., cast upon the beach at North-west Islet. Another was found on Bramble Cay by Mr. C. Hedley.

Localities.—North-west Islet, Capricorn Group, Queensland; speared by Mr. C. Coles, December 1st, 1925.

A male specimen is in the Australian Museum from off Flat Top Island, Mackay, Queensland; coll. "Geranium," 12th October, 1925. Regd. No. IA.2573.

(1) Vide McCulloch and Whitley, Mem. Old Mus. viii., pt. 2, 1925, 125-182.

(2) Ogilby and McCulloch, Proc. Roy. Soc. N.S. Wales, xlii., 1909, 287, f. 1.

CHILOSCYLLIUM OCELLATUM.

Squalus ocellatus Bonnaterre, Tabl. Encycl. Meth. Ichth., 1788, 8. La mer du Sud.

Chiloscyllium ocellatum Ogilby & McCulloch, Proc. Roy. Soc. N.S. Wales, xlii., 1908, 290.

Very common amongst coral at North-west Islet, where, like the preceding species, it is known as "Wobbegong."

Family RHINOBATIDAE.

RHINOBATUS ARMATUS.

Rhinobatis armatus Gray, Ill. Indian Zool., ii., 1832-5, pl. xcix. (fide Sherborn).

Rhinobatus armatus Ogilby, Mem. Q'ld. Mus., v., 1916, 85 & 95, f. 1.

This species is evidently common in shallow water at North-west Islet. The largest seen was a male, 42.5 inches in length. One female, 583 mm. long, preserved (Austr. Mus. Regd. No. IA.2590). Another specimen, in the Australian Museum, is from Townsville, Queensland.

Family DASYATIDAE.

TAENIURA LYMMA.

Raja lymma Forskal, Descr. Anim., 1775, 17. Red Sea.

Taeniura lymma McCulloch, Rec. Austr. Mus., xiii., 2, 1920, 41, pl. x.

One large specimen from North-west Islet, speared by Mr. C. Coles; Austr. Mus. Regd. No. IA.2588. Other specimens are in the Museum from Cape York, Queensland, and the Sir Edward Pellew Islands, Gulf of Carpentaria.

Family CLUPEIDAE.

STOLEPHORUS ROBUSTUS.

Spratelloides robustus Ogilby, Proc. Linn. Soc. N.S. Wales, xxii., 1, 1897, 64. Coast of New South Wales.

Stolephorus robustus McCulloch, Rec. Austr. Mus., xiii., 2, 1920, 42, pl. xi., f. 1.

Three specimens, 32-40 mm. long; ejected by White-capped Noddies (*Megalo-
lopterus minutus*) on North-west Islet.

Family ENGRAULIDAE.

ENGRAULIS AUSTRALIS.

Atherina australis White, Journ. Voy. N.S. Wales, 1790, 296, pl. —, f. 1. New South Wales.

Engraulis australis McCulloch, Rec. Austr. Mus., xiii., 2, 1920, 43, pl. xii., f. 1.

Dr. W. MacGillivray saw a White-capped Noddy (*Megalo-
lopterus minutus*) vomit fifty anchovies of this species. Eight specimens, 27-43 mm. long, were preserved.

Loc.—North-west Islet, Capricorn Group, Queensland; 5th December, 1925.

Family MURAENIDAE.

GYMNOTHORAX UNDULATUS.

Muraenophis undulata Lacepède, Hist. Nat. Poiss., v., 1803, 629 & 644, pl. xix., f. 2. No locality given.

Muraena (Gymnothorax) undulata Weber & Beaufort, Fish. Indo-Austr. Archip., iii., 1916, 376 (references and synonymy).

Two specimens, 139-285 mm. long. Purplish with yellow reticulations.

Family SYNGNATHIDAE.

MICROGNATHUS BREVIROSTRIS.

Syngnathus brevirostris Rüppell, Neue Wirbelth. Fische, 1840, 144. Massowah, Red Sea.

Corythoichthys tanakae Jordan & Starks, Proc. U.S. Nat. Mus., xxx., 1906, 696, f. 2. Tanegashima, southern Japan.

Two males and six females, 24 to 62 mm. long, agree with the figure and description by Jordan & Starks quoted above. Other specimens in the Australian Museum are from Port Denison.

Family APOGONIDAE.

APOGON FASCIATUS.

Mullus fasciatus White, Journ. Voy. N.S. Wales, 1790, 268, pl. —, f. 1. New South Wales.

Amia fasciata fasciata McCulloch, Biol. Res. Endeavour, iii., 3, 1915, 116 (references and synonymy).

One specimen, 28.5 mm. long.

APOGON FASCIATUS NOVEMFASCIATUS.

Apogon novemfasciatus Cuvier & Valenciennes, Hist. Nat. Poiss., ii., 1828, 154. Timor & Guam.

Amia fasciata novemfasciata McCulloch, Biol. Res. Endeavour, iii., 3, 1915, 117. One specimen, 60 mm. long.

Family SERRANIDAE.

PLECTROPOMA MACULATUM LEOPARDUS.

Holocentrus leopardus Lacepède, Hist. Nat. Poiss., iv., 1802, 332, & 367. No. locality.

Plectropoma maculatum leopardus Boulenger, Cat. Perc. Fish. Brit. Mus., i., 1895, 161.

Several specimens of this species were captured by trailing a line from a launch between North-west Islet and Wilson Islet, Capricorn Group, 3rd December, 1925. It is known locally as the Coral Cod.

D.viii/11; A.iii/8; P.i/15; V.i/5; C.13.

Life-colours.—Flushing pearl-grey with many small bright blue spots which extend on to the vertical fins. Eyelid greenish; iris golden. Edges of pectorals orange; upper and lower margins of caudal flushed with wine-red. After death, the ground colour becomes uniform reddish-brown and the spots fade to a lighter blue. Pectoral rays yellowish, the membranes hyaline. Caudal edged with white.

Family PLESIOPIDAE.

BELONEPTERYGION FASCIOLATUM.

Acanthoclinus fasciolatus Ogilby, Mem. Austr. Mus., ii., 1889, 63, pl. iii., f. 3. Lord Howe Island.

Belonepterygion fasciolatum McCulloch, Mem. Q'ld. Mus., iii., 1915, 51.

Common in coral blocks at North-west Islet.

Family CHAETODONTIDAE.

CHAETODON RAINFORDI.

Chaetodon rainfordi McCulloch, Rec. Austr. Mus., xiv., 1, 1923, 4, pl. ii., f. 1. Holbourne Island, off Port Denison, Queensland.

One specimen, 98 mm. long. Common amongst coral at North-west Islet.

HOLACANTHUS PERSONIFER.

Holacanthus (Chaetodontoplus) personifer McCulloch, Rec. W. Austr. Mus., i., 3, 1914, 221, pl. xxxi. Shark Bay, Western Australia. *Id.* Biol. Res. Endeavour, iv., 4, 1916, 195, pl. lvi., f. 2.

Fairly common at North-west Islet, where it is known as the Yellow-tailed Leather-jacket. One large specimen preserved.

Family POMACENTRIDAE.

POMACENTRUS CHRYSURUS.

Pomacentrus chrysurus Cuvier & Valenciennes, Hist. Nat. Poiss., v., 1830, 423. (ex *Chaetodon chrysurus* Broussonet M.S.). La Mer du Sud.

One specimen, 76 mm. long (IA.2598). Two others vomited by Reef Heron (*Demigretta sacra*), at North-west Islet, 26th November, 1925.

This species has been recorded from Darnley Island by Alleyne & Macleay (3) and from Bowen by Schmeltz (4). Specimens are in the Australian Museum from St. Crispin Reef, off Port Douglas, and Cairns, Queensland.

AMPHIPRION POLYMNUS.

Anthias polymnus Bloch, Nat. Ausl. Fische, vi., 1792, 103 (*vide* Sherborn), and Ichtyologie, ix., 1797, 89, pl. cccxvi., f. 1. East Indies.

Prochilus polymnus Bleeker, Atlas Ichth., ix., 1877, pl. cccc., f. 7-8.

Amphiprion polymnus Jordan & Seale, Proc. Davenport Acad. Sci., x., 1905, 13, pl. vii.

One specimen (IA.2626), 62 mm. long, from North-west Islet, where the species is common amongst anemones in a restricted area of the lagoon. The young have a white band through the caudal peduncle which disappears with age; fins orange-yellow in life.

GLYPHISODON COELESTINUS.

Glyphisodon coelestinus Cuvier & Valenciennes, Hist. Nat. Poiss., v., 1830, 464, and ix., 1833, 508 (ex *Chaetodon coelestinus* Solander M.S.). Mer des Indes.

Abudefduf coelestinus Jordan & Seale, Bull. U.S. Fish. Bur., xxv., 1906, 285, pl. xli., f. 1.

One young specimen, 21 mm. long, from North-west Islet constitutes a new record for Queensland. Others are in the Australian Museum from Murray Island, Two Isles, Port Denison, and Masthead Island, Queensland; Lord Howe Island; New Hebrides; Philippines; Amboina; Samoa; Friendly Islands.

GLYPHISODON ZONATUS.

Plate xxxiii.

Glyphisodon zonatus Cuvier & Valenciennes, Hist. Nat. Poiss., v., 1830, 483. New Guinea.

Glyphidodontops zonatus Bleeker, Atl. Ichth., ix., 1877, pl. cccvii., f. 3.

Glyphidodon brownriggii Günther, Fische Südsee, vii., 1881, 232, pl. cxxvii., f. c. (not *Chaetodon brownriggii* Bennett).

Two specimens, 56-88 mm. long, agree excellently with Günther's figure quoted above. Each has D.xiii/13; A.ii/13, last rays divided.

Localities.—Murray Island, Torres Straits (C. Hedley and A. R. McCulloch); Two Isles, N. Queensland (C. Hedley and E. A. Briggs); North-west Islet, from coral blocks (G. P. Whitley).

(3) Alleyne and Macleay, Proc. Linn. Soc., N.S. Wales, i., 1877, 343.

(4) Schmeltz, Cat. Mus. Godeff. vii., 1879, 52.

Family SIGANIDAE (5).

SIGANUS CAPRICORNENSIS sp. nov.

Plate xxxiv.

D.i, xiii/10; A.vii/9; P.16; V.i/3/i; C.17.

Head (59 mm.) 4.3 in the length to the end of the middle caudal rays (258). Depth below 6th dorsal spine (105) 2.4 in the same. Eye (16) equal to narrowest part of caudal peduncle, 3.6 in the head. Interorbital (21) 2.8, 4th dorsal spine (37) 1.6 in the same.

Form elongate ovate, compressed. Profiles convex, that of dorsal surface steeper than that of ventral.

Head largely naked, but with scales on cheeks, and upper part of operculum. Eye large, equal in diameter to its distance from the supero-posterior angle of the maxillary. Interorbital markedly convex. Snout rounded. Two nostrils on each side of head, posterior larger than anterior. Opercular edges entire; a small opercular flap. Gill-openings wide. Prominent striae on preoperculum, operculum, and exposed portion of shoulder-girdle, and a few smaller ones at the postero-inferior border of the orbit. A bony crest in front of the eye. Maxillary not reaching vertical of anterior border of eye. Teeth forming a comb-like cutting edge.

Body covered with very small cycloid scales which extend onto the nape, breast, and caudal fin. Vent slightly behind posterior membranes of ventrals. Lateral line indistinct, following the dorsal curvature.

Dorsal spines strong, preceded by a procumbent spine; middle rays much longer than the last. Anal similar to dorsal but with thicker spines and shorter rays. Pectoral slightly emarginate, 4th ray longest. Ventrals angular, the first spine equal in length to the 5th anal spine. Caudal forked.

Colours.—Ground colour chocolate brown, a little lighter on the membranes between the dorsal and anal spines. Honey-brown spots, slightly wider than their interspaces, extended over the head (including eyes and lips), body, tail and dorsal and anal spines and rays during life, but those on the head and fins have faded away since death and preservation in formalin. Oblique bars of honey-brown on dorsal and anal fin-membranes; fork of caudal edged with the same colour. Pectoral rays yellowish-brown, membranes hyaline. Tips of spines and an area between the ventrals whitish. No dark blotch on shoulder.

Described and figured from the holotype, 258 mm. long to the end of the middle caudal rays. Australian Museum Regd. No. IA.2589.

Locality.—Coral reef at North-west Islet, Capricorn Group, Great Barrier Reef, Queensland; coll. G. P. Whitley, December, 1925.

Family LABRIDAE.

CHOERODON OLIVACEUS.

Choerops olivaceus De Vis., Proc. Linn. Soc. N.S. Wales, ix., 4, 1885, 876. Cardwell and Cape York, Queensland.

One large specimen (IA.2591) from North-west Islet, where it is known as the "Blue-bone" parrot fish. Other specimens in the Australian Museum are from Wide Bay district, Queensland, and Port Jackson, New South Wales.

Colours.—Ground-colour bluish-green, gradating to olivaceous on the head. From the corner of the jaw to near the ventral fin, the ground colour gives place to white. Eye peacock blue. Teeth bluish. An indistinct blue bar from the upper border of the operculum to the eye. A series of short yellow vertical bars

(5) The validity of Forskal's name *Siganus* is doubtful, but I follow most modern authors in using it until an opportunity for investigating the status of the fish names in the "Descriptions Animalium" shall arise.

on a blue ground near the preorbital border. Ill-defined flushes of blue occur on the body, one of which, darker than the rest, extends along the side from below the pectoral. Faint longitudinal bars of blue, interspersed with yellow, on the caudal peduncle.

Dorsal fin greyish-blue mottled with yellow; pencils of rays and spines bluish with inframarginal bands of orange. Anal light blue proximally gradating to greyish, crossed by irregular yellow bars; margin whitish. Pectoral dull bluish, upper rays darkest. Ventral white; a yellow streak along first ray, extreme bases of rays violet. Caudal greyish with yellow blotches, membranes peacock blue between bases of rays.

CHOERODON VENUSTUS.

Choerops venustus De Vis, Proc. Roy. Soc. Q'ld., i., 3, 1884, 147. Moreton Bay.

Recorded from North-west Islet by Ogilby (6). A specimen in the Australian Museum (IA.2072) has fourteen dorsal spines. It was collected between 17° and 19° S. Lat., Great Barrier Reef, Queensland, by Dr. W. E. J. Paradijs, of H.M.A.S. "Geranium."

Family CORIDAE.

HALICHOERES OPERCULARIS.

PlatyGLOSSUS opercularis Günther, Cat. Fish. Brit. Mus., iv., 1862, 148. Fiji. *Id.*

Playfair, Fish. Zanzibar, 1866, 95, pl. xii., f. 1.

Halichoeres opercularis Jordan & Seale, Fish. Samoa, 1906, 302, pl. xlvii., 3.

Colours.—Ground-colour light green. A broad salmon-tinted hook-shaped band on cheeks and opercles bordered with white; a bronze blotch over opercular flap, above which a bronze band extends from maxilla, dips below orbit and follows curve of hook-shaped band. Pupil black, surrounded by coppery and an outer area of light green. Chin light sea-green. Some bronze bands extend along the scale-rows of the body from the head but are irregular and broken. A blotch of dark-brown-edged scales on middle of side, another behind opercular flap and another immediately before caudal peduncle. A dark scale on back below 6th dorsal spine. A large blotch of rose on lower part of side before origin of anal. Dorsal light green with oblique wavy reddish-brown bars, between which are yellow blotches. A black ocellus on 2nd and 3rd dorsal spines. Anal light yellowish-green with oblique red bars, darker proximally, interspersed with white-edged yellow blotches. Caudal rays yellow, the median with reddish-brown blotches; membrane hyaline. Pectoral rays yellow. Ventrals very light yellowish-green with a tinge of chestnut anteriorly.

Locality.—North-west Islet; found dead on reef by Mrs. V. Lowe, 10th December, 1925. Specimens are in the Australian Museum from Masthead Island, St. Crispin Reef, and Murray Island, Queensland; Lord Howe Island; New Hebrides; Samoa.

PSEUDOLABRUS GUNTHERI.

Pseudolabrus guntheri Bleeker, Versl. Akad. Amsterdam, xiv., 1862, 130. New

Holland. (*vide* Weber & Beaufort, Fish. Indo-Austr. Archip., i., 1911, 25).

Id. McCulloch, Rec. Austr. Mus., ix., 3, 1913, 368, pl. xvii (references and synonymy).

One young specimen, 32 mm. long.

Family SCARIDAE.

SCARUS FASCIATUS.

Scarus fasciatus Cuvier & Valenciennes, Hist. Nat. Poiss., xiv., 1840, 222.

Moluccas.

Pseudoscarus rivulatus Alleyne & Macleay, Proc. Linn. Soc. N.S. Wales, i., 1877,

(6) Ogilby, Commenc. Fish. Fisher, Qld, 1915, 34.

345. *Id.* Kent, Great Barrier Reef, 1893, 295 & 370, chromo. pl. xv., 4—5a. (Not *Scarus rivulatus* Cuv. & Val.).

One specimen, 340 mm. long, shows the following characters:—D.ix/10; A.ii/9. L. lat. 24. Small molars present. Caudal margin moderately lunate.

Colours when fresh.—General colour bluish-green, each scale on sides with a nut-brown centre, those on breast and top of head without. Cheeks and lower surface of head orange. Chin and preorbital region crossed by reticulating green markings. Pupil yellow; eyelids green. Teeth white.

Dorsal edged deep blue-green, with a wide inframarginal orange area which changes to dirty orange near the green base of the fin. Large oval green spots between spines and rays. Anal dirty yellowish-grey, broadly edged with bluish-green; green interradiat blotches near base of fin. Caudal orange-brown, with a distal row of blue and a proximal row of green blotches. Ventral yellowish with a blue band anteriorly. Lower portion of pectoral bright green, the edge hyaline; upper border blue followed by a brown bar. Axil dark brown.

Localities.—North-west Islet reef, Capricorn Group, Queensland; speared by Mr. George Haack, 5th December, 1925.

North Reef, Capricorn Group (Ogilby, *Commere. Fish. Fisher. Q'ld.*, 1915, 34, as *Callyodon rivulatus*).

Cape Grenville, Queensland (Alleyne & Macleay, *Loc. cit.*, 346).

Family PARAPERCIDAE.

PARAPERCIS CYLINDRICA.

Sciaena cylindrica Bloch, Nat. Ausl. Fische, vi., 1792, 42 (*vide* Sherborn), and Ichtyologie, ix., 1797, 37, pl. cxcix., f. 1. Locality ?.

One specimen of this common Queensland fish was collected at North-west Islet by Miss Hilda Geissmann; a smaller one was found in the stomach of a ray (*Dasyatis* sp.) together with prawns, gobies, and gastropod shells.

Specimens are in the Australian Museum from Queensland, Lord Howe Island, Friendly Islands, Amboina, and Cochin China.

Family Gobiidae.

PARAGOBIODON ECHINOCEPHALUS.

Gobius echinocephalus Rüppell, Atl. Reise Nordl. Afrika, Fische, 1830-1, 136, pl. xxiv., 3. Massowah, Red Sea.

Paragobiodon echinocephalus McCulloch & Ogilby, Rec. Austr. Mus., xii., 10, 1919, 239, pl. xxxiv., f. 1 (references and synonymy).

Ten specimens, 22-29 mm. long. Common at North-west Islet, where they are called "Greenies." Found amongst coral which Mr. C. Hedley, F.L.S., has kindly identified as *Seriatopora hystrix* Dana, in the branches of which they remain even when the coral is taken from the water.

Life-colours.—Green, lighter on abdomen; dorsal and anal tinged yellowish-green. Tips of dorsal, anal and caudal rays brown. Ventrals and pectorals green. Eye dark blue, surrounded by a dark golden ring. Other specimens agree in colouration with the form A. of McCulloch & Ogilby (*loc. cit.*).

BATHYGOBIUS FUSCUS.

Gobius fuscus Rüppell, Atl. Reise Nordl. Afrika Fische, 1830-1, 137. Red Sea, *Mapo fuscus* McCulloch & Ogilby, Rec. Austr. Mus., xii., 10, 1919, 231 (references and synonymy).

Bathygobius fuscus Jordan & Jordan, Mem. Carneg. Mus., x., 1, 1922, 78. *Id.* McCulloch & Whitley, Mem. Q'ld. Mus., viii., 2, 1925, 171.

Several specimens obtained, 40-70 mm. long.

AMBLYGOBIUS PHALAENA.

Gobius phalaena Cuvier & Valenciennes, Hist. Nat. Poiss., xii., 1837, 92. Vanicolo.

Amblygobius phalaena McCulloch & Ogilby, Rec. Austr. Mus., xii., 10, 1919, 253 (references and synonymy).

One specimen, 36 mm.

CALLOGOBIUS HASSELTII.

Eleotris hasseltii Bleeker, Nat. Tijdschr. Ned. Indie, i., 1851, 253. Anjer, W. Java.

Callogobius hasseltii McCulloch & Ogilby, Rec. Austr. Mus., xii., 10, 1919, 217 (references and synonymy).

Three specimens, 25-47 mm. long.

Family ELEOTRIDAE.

ASTEROPTERIX SEMIPUNCTATUS.

Asterropterix semipunctatus Rüppell, Atl. Reise Nordl. Afrika, Fische, 1830-1. 138, pl. xxxiv., f. 4. Massowah, Red Sea. *Id.* McCulloch & Ogilby, Rec. Austr. Mus., xii., 10, 1919, 273 (references and synonymy).

Eleven specimens, 34-50 mm. long, from shallow reef waters of North-west Islet, where the species was commonly found. Austr. Mus. Regd. No. IA.2638.

EVIOTA VIRIDIS.

Allogobius viridis Waite, Rec. Austr. Mus., v., 3, 1904, 177, pl. xxiii., f. 3. Lord Howe Island.

Eviota viridis McCulloch, *Op. cit.*, xii., 10, 1919, 260.

Seventeen specimens, 17-32 mm. Very common at North-west Islet.

Family BLENNIIDAE.

BLENNIUS INTERMEDIUS.

Blennius intermedius Ogilby, Mem. Q'ld. Mus., iii., 1915, 127. Darnley Island.

Eleven specimens, 18-44 mm. long, from North-west Islet. Specimens from the Whitsunday Group and Bowen, Queensland, collected by Mr. E. H. Rainford, in the Australian Museum.

ECSENIUS MANDIBULARIS.

Ecsenius mandibularis McCulloch, Rec. Austr. Mus., xiv., 2, 1923, 122, pl. xv., f. 1-2. Masthead Island, Q.

Two spirit specimens, 39 mm. long, from North-west Islet. One is lilac-brown, the other light brown with a dark head; both have white lateral spots. The types are faded formalin specimens.

PETROSCIRTES ROTUNDICEPS.

Petroscirtes rotundiceps Macleay, Proc. Linn. Soc. N.S. Wales, vi., 1881, 9. Port Jackson, N.S. Wales.

Three specimens, 38-55 mm. long.

Specimens in the Australian Museum from Moreton Bay, Port Denison, Great Sandy Strait, Dunk Island, Caloundra, and Rat Island, Queensland, and Port Stephens and Port Jackson, New South Wales.

PETROSCIRTES LINEATUS.

Petroscirtes lineatus De Vis, Proc. Linn. Soc. N.S. Wales, ix., 1884, 698. Murray Island, Torres Strait.

Three specimens, 21-57 mm. long, from North-west Island, and one, 63 mm., from Port Denison, show the following characters:—D.29-31; A.17-21; black band on dorsal present or absent.

SALARIAS FASCIATUS.

Blennius fasciatus Bloch, Nat. Ausl. Fische, ii., 1786, 110, pl. elxii., f. 1. (*vide* Sheborn).

Salarias fasciatus McCulloch, Rec. Austr. Mus., xiv., 2, 1923, 123, pl. xv., f. 3.

Six specimens, 44-75 mm. Common in crevices of coral and rocks.

SALARIAS MELEAGRIS.

Salarias meleagris Cuvier & Valenciennes, Hist. Nat. Poiss., xi., 1836, 332, "terre de Van-Diemen" = Timor? *Id.* McCulloch & McNeill, Rec. Austr. Mus., xii., 2, 1918, 16. *Id.* McCulloch, Rec. Austr. Mus., xiv., 5, 1926, 12.

Eight specimens, 56-100 mm. long, show interesting colour-variation. Six have the characteristic markings figured by Günther (7), whilst the others are very dark brown so that the spots and bars are very difficult to detect.

SALARIAS DUSSUMIERI.

Salarias dussumieri Cuvier & Valenciennes, Hist. Nat. Poiss., xi., 1836, 310, Malabar. *Id.* McCulloch & McNeill, Rec. Austr. Mus., xii., 2, 1918, 18, pl. iv., f. 2.

Three specimens, 71-85 mm. long. The two anterior dorsal rays of the smallest specimen are deformed, being little more than half the height of the rest and strongly curved.

SALARIAS CRENULATUS PALLIDUS subsp. nov.

Salarias crenulatus McCulloch, Rec. Austr. Mus., xiv., 2, 1923, 124, pl. xvi., f. 1-2. *Id.* McCulloch & Whitley, Mem. Q'ld. Mus., viii., 2, 1925, 175. (? Not Weber).

The specimens described by McCulloch from Masthead Island, which is very near North-west Islet, differ from the typical *S. crenulatus* Weber (8) in several details which he set forth on page 125 of his paper quoted above. I consider these differences worthy of subspecific status and accordingly propose the name *pallidus* for the Australian form of this species.

One spirit specimen, 53 mm. long, from North-west Islet (IA.2609).

TRIPTERYGION ATROGULARE.

Tripterygion atrogulare Günther, Journ. Mus. Godeff., i., 1873, 267. Bowen. Five specimens, 20-42 mm.

Family GOBIESOCIDAE.

LEPADICHTHYS FRENATUS.

Lepadichthys frenatus Waite, Rec. Austr. Mus., v., 3, 1904, 180, pl. xxiv., f. 2. Lord Howe Island.

Five specimens, 17-43 mm. long. Fairly common in coral blocks.

(7) Günther, Fische Sudsee vi., 1877, 208, pl. cxvi., f. d.

(8) Weber, Notes Leyden Mus. xxxi., 1909, 144, and Siboga Exped. lvii., Fische 1913, 532, f. 112. Sanana, Sula Islands, and Tiur Island, East Indies.

Family CONGROGADIDAE.

CONGROGADUS.

Congrogadus Günther, Cat. Fish. Brit. Mus., iv., 1862, 388 (*subducens*).

This name has been mis-spelled *Conyrodus* by Lydekker, Roy. Nat. Hist., v., 1896, 439. Lydekker's name appears to have been overlooked.

CONGROGADUS SUBDUCENS.



Text-fig. 1.

Congrogadus subducens Richardson. Larva, 23 mm. long, from North-west Islet, Capricorn Group, Queensland. G. P. Whitley, *del.*

Machaerium subducens Richardson, Ann. Mag. Nat. Hist., xii., September, 1843, 175, pl. vi. Port Essington. *Id.* Rept. 12th meet. Brit. Assoc. Adv. Sci. (1842) 1843, Trans. Zool. Sect., 69. *Id.* Ichth. Erebus & Terror, 1846, 72, pl. xlv., f. 1-6.

Congrogadus subducens Günther, Cat. Fish. Brit. Mus., iv., 1862, 388.

A larva, 23 mm. long, has the following characters: D.69; A.58; P.10; C.9. Body naked. Origin of dorsal over pectoral fin. No lateral line discernible on body. When alive, it was green with transparent fins. Head crossed by radiating silvery bars edged superiorly with blackish. Eye golden.

Loc.—North-west Islet, Capricorn Group, Queensland; rock-pool, 12th December, 1925, coll. G. P. Whitley.

A larger larva, 46 mm. long, was collected by Hedley and McCulloch at Murray Island, Torres Strait, in August or September, 1907. It has minute scales, and the anterior part of the lateral line is clearly discernible under a lens.

BLENNODESMUS SCAPULARIS.

Blennodesmus scapularis Günther, Proc. Zool. Soc. Lond., 1871, 667, pl. lxxvii., f. a. Port Mackay, Queensland. *Id.* McCulloch, Mem. Q'ld. Mus., iii., 1915, 55. Three specimens, 16-88 mm. long.

Family BROTLIDAE.

DINEMATICHTHYS MIZOLEPIS.

Dinematichthys mizolepis Günther, Ann. Mag. Nat. Hist. (3), xx., 1867, 66. Cape York.

Three specimens from North-west Islet. Colour in life: pinkish, the fins redder. The largest specimen in the Australian Museum is 80 mm. long, from Port Denison, Queensland; coll. E. H. Rainford.

EXPLANATION OF PLATES.

Plate xxxiii.

Glyphisodon zonatus Cuvier & Valenciennes. A series of specimens from the New Hebrides, showing variation of colouration with growth. Natural size. A. R. McCulloch, *del.*

Plate xxxiv.

Siganus capricornensis Whitley. Holotype, 258 mm. long to the end of the middle caudal rays, from North-west Islet, Capricorn Group, Queensland.

THE BIOLOGY OF NORTH-WEST ISLET, CAPRICORN GROUP.

(D.). MARINE MOLLUSCS.

By TOM IREDALE.

(By Permission of the Trustees of the Australian Museum).

Plate xxxv.

The Marine Mollusca of the Capricorn Group were catalogued by Hedley (1906-1907), where an account of Masthead Reef as a collecting ground is given based on the results of the expedition which stayed there on October 23-31, 1904.

Four hundred and forty-seven species were listed, while more than one hundred were left undetermined. Of these listed no fewer than fifty-five were described as new to science, while one hundred and twenty-three were additions to the Australian Molluscan fauna.

The hundred left unworked have been utilised since in connection with other collections, and in 1909 Hedley described *Cuna capillacea* (p. 425, pl. xxxvi., figs. 9-10), *Arcopagia dapsilis* (p. 434, pl. xxxvii., fig. 33), *Triphora tribulationis* (p. 440, pl. xl., figs. 53-54), *Odostomia chorea* (p. 445, pl. xli., fig. 66), *Odostomia sperabilis* (p. 448, pl. xli., fig. 71), *Marginella anxia* (p. 452, pl. xliii., figs. 86-87), *Mangelia anxia* (pl. 455, pl. xliii., fig. 89), *Mangelia naufraga* (p. 458, pl. xliv., figs. 93-95), and *Retusa pharetra* (p. 464, pl. xliv., fig. 102), from the Hope Islands, noting that he had previously obtained these species at the Capricorn Group. In 1905 (2) Hedley had noted named species from the group, and in 1908 he amended some identifications. Describing as new *Chione capricornea* (p. 475, pl. ix., figs. 24-25).

In 1912 another new species was described, *Couthouyia aspera* (p. 141, pl. xli., fig. 18).

In 1919 *Tonna cerevisina* Hedley was noted; in 1921 *Tridacna maxima* var. *fossor* was introduced by Hedley, the type being from Masthead Islet.

In 1922 Hedley revised the Australian Turridae and some twenty odd species were localised as from Masthead Reef, five of these being described as new, others already recorded being listed with more accurate names. The species recorded may be here noted:—

Turris marmorata Lam. (p. 215), *Asthenotoma subtilinea* Hedley (p. 219), *Inquisitor mastersi* Brazier (p. 243), *Lienardia lutea* Pease (p. 289), *L. mighelsi* Ire. & Tomlin (p. 289), *L. strombilla* Hervier (p. 294), *L. vultuosa* Reeve (p. 294), *Heterocithara hirsuta* Folin (p. 298), *H. zebuensis* Reeve (p. 300), *Anacithara brevicostata* Hed. type (p. 301), *A. conata* Hed. (p. 301), *A. exquisita* Hed. type (p. 301), *A. naufraga* Hed. (p. 304), *A. stricta* Hed. type (p. 304), *Pseudoraphitoma informis* Hed. (p. 310), *Daphnella marmorata* Hed. (p. 328), *Vepracula vacillata* Hed. (p. 330), *Hemidaphne cyclophora* Desh. (p. 332), *Exomilus anxius* Hed. (p. 333), *Nepotilla tropicalis* Hed. type (p. 337), *Asper-*

daphne capricornea Hed. type (p. 340), *Pseudodaphnella barnardi* Braz. (p. 343), *Eucyclotoma carinulata* Souv. (p. 355).

Shirley (1915) listed a small series of shells collected on North-west Island by Miss Peberdy, apparently the first named from that islet. The names used by Shirley differ in many cases from those given by Hedley, and his determinations are not to be trusted. I therefore give his short list as published: *Atactodea striata* Gmelin, *Trochus calcaratus* Sow., *Chrysostoma paradoxa* Born, *Quoyia decollata* Q. & G., *Cerithium columba* Sby., *C. hanleyi* Sby., *C. rubum* Martyn, *C. granosum* Kiener, *Clava aspera* L., *C. vertaga* L., *Natica chinensis* Lam., *Cypraea isabella* L., *C. annulus* L., *C. caurica* L., *C. erronea* L., *Conus spectrum* L., and *Arcularia jonasi* Dunk (= *nana* A. Ad.).

Mr. G. P. Whitley made a small collection at North-west Island and a few were picked up at Wilson Islet. These were mostly common Queensland species, but here again a few of interest can be noted and they may be useful hereafter in connection with more material. A *Pinna* near *menkei* Reeve, a *Turbo* of the *foliaceus* group, *Halotis ovina* Gmel., and some nudibranchs call for notice.

Hedley had made a collection of cuttle fish bones and these he recorded as *Sepia esculenta* Hoyle, *S. cultrata* Hoyle, *S. pfefferi* Hoyle, leaving another undetermined. I studied these in connection with the Sydney ones reported upon in the last number of this Journal, and, as they appeared to be of great interest, I asked Whitley, who had helped me in connection with the Sydney ones, to pay especial attention to these. My request was complied with, though they were not found plentifully, and eight species were brought back. I am describing these in this place.

SOLITOSEPIA SUBMESTUS n.sp.

Plate xxxv., fig. 3, 4.

Shell smaller than average *S. mestus*, narrower, more elongate, inner cone more strongly marked, the outer cone passing ventrally in front of the spine and showing a depression which is filled with chitin; the dorsal surface flatter and the ray sculpture more defined.

Dimensions: 68 x 24 mm. Type: Masthead I.

SOLITOSEPIA ROZELLA PEREGRINA n.subsp.

Shell smaller, shorter and comparatively broader, the inner cone wider, the rose colour restricted to a narrow band; the dorsal sculpture more pronounced than in the typical form.

Dimensions: 89 x 34 mm. Type: North-west I.

SOLITOSEPIA PLANGON ADHAESA n.subsp.

Shell narrower, more elongate, the inner cone more strongly developed, the outer cone advancing in front of the spine as a chitinous rim; the dorsal sculpture more pronounced and the dorsal surface more flattened than in the typical form.

Dimensions: 88 x 26 mm. Type: North-west I.

Remarks: These three forms, representing species of the Sydney fauna, may show greater differences when the animals are examined. The lastnamed was the species recorded by Hedley as *S. cultrata* Hoyle in error.

GLYPTOSEPIA OPIPARA Ire.

This species was described from Masthead Island, but Whitley did not find it as abundant as Hedley did.

ACANTHOSEPION WHITLEYANUM Ired.

This species was found at North-west Island, as it is the only member of the tropical forms of *Sepia* which has so far been found as far south as Sydney. From shell characters it appears nearest to the type of *Acanthosepion*, and the offshoots mentioned in my former essay may be here indicated.

ACANTHOSEPION ELLIPTICUM ADJACENS n.subsp.

Plate xxxv., fig. 5, 6.

Shell larger than *S. elliptica* Hoyle (Chall. Reports Zool., Vol. xvi., p. 131, pl. xix., figs. 14, 24), from the Arafura Sea, with the anterior (ventral) wall of the inner cone more pronounced, the unstriated area of less extent, the dorsal sculpture much less marked; spine rounded, delicate, recurved.

Dimensions: 105 x 46 mm. Type: North-west I.

Remarks: The group to which this form belongs may be differentiated subgenerically with the name *Fiscisepia*, the present form being taken as the type.

Genus *PONDERISEPIA* nov.

Shell very large, crass, back rounded, coarsely pustulose, spine very thick, rounded, short, ventral surface much swollen.

Type: *P. eclogaria*, infra.

PONDERISEPIA ECLOGARIA n.sp.

Plate xxxv., fig. 7, 8.

Shell very large, elongately oval, more than twice as long as broad.

Dorsal surface well rounded, creamy white, darker laterally, very coarsely pustulose throughout, a narrow chitinous edge present, which vanishes posteriorly; outer cone strongly calcified.

Ventral surface swollen post-medially with a shallow median sulcus: the striae of the striated area very close together. Spine very short, thick, rounded. Inner cone well developed, lengthened, not produced ventrally as a ledge.

Dimensions: 326 x 128 mm. Type: Masthead Island (coll. Hedley).

Remarks: The type specimen was recorded as *Sepia esculenta* Hoyle, but specimens of that species prove very different and referable to *Acanthosepion*. Naef has proposed a subgenus *Platysepia* for the species *S. esculenta*, which name may be used subgenerically. The present species appears to be closely allied to *S. hercules* Pilsbry, and specimens of the same group are in this Museum from Fiji, and New Hebrides, while Mr. A. F. Basset Hull has collected it for me at New Caledonia, as well as in North Queensland.

Genus *CRUMENASEPIA* nov.

Shell of medium size, elongately oval, definitely distinguished by the development of the inner cone ventrally into a chitinous pocket.

Type: *C. hulliana*, infra.

CRUMENASEPIA HULLIANA n.sp.

Plate xxxv., fig. 1, 2.

Shell medium, elongately oval.

Dorsal surface rounded, finely pustulose, creamy, darker laterally: three raised rib-like rays can be distinguished, the median one rounded, rather notable, though not a great deal raised, the lateral ones obsolete outer cone weakly calcified but pustules more prominent, whitish; a large chitinous margin along the dorsal surface and extending round the outer cone. Ventral surface not

much swollen anteriorly, a very shallow median depression. Spine short, crass, almost separated ventrally by chitinous margin, strongly calcified dorsally. Inner cone well developed, extending ventrally across and forming a large deep pocket of chitinous matter which is concave externally.

Dimensions: 180 x 65 mm. Type: Howick Island, North Queensland.

Remarks: This represents a well marked group of which two or three species have been described as *Sepia singalensis* Goodrich from Ceylon, *S. koettlitzii* Hoyle & Standen from Somaliland and probably *S. zanzibarica* Pfeffer from Zanzibar. Dr. Paradise collected it at the Pellew Group, Gulf of Carpentaria, so that it has a wide range, extending to the southern limit of the Great Barrier Reef.

METASEPIA PFEFFERI LAXIOR subsp. n.

Plate xxxv., fig. 9, 10.

Hedley collected three shells of graded size which he determined as Hoyle's *S. pfefferi* (Chall. Rep. Vol. XVI., 1886, p. 145, pl. xxi., figs. 1-10) described from a female specimen dredged in the Arafura Sea. The shell fairly agrees with Hoyle's account, but as the Masthead specimens all agree in being comparatively broader, I designate them as above. Hoyle's type was a female, measuring 45 x 24, while Hedley's shells measure 51 x 32, 36 x 24, 27 x 16. Hoyle definitely stated no spine was present, but in the largest specimen there is a calcification, unfortunately broken, which suggests a spine formation.

Order LORICATA.

Hedley recorded *Callistochiton antiquus* Reeve, *Cryptoplax burrowi* Smith and *Acanthopleura spiniger* Sowerby. Later Ashby added *Acanthochiton shirleyi*.

In the Monograph of Australian Loricates appearing in this Periodical, Iredale and Hull described the firstnamed as a new species, *Callistelasma generos* and added two other new species which had been dredged by Hedley, viz.: *Parachiton capricornicus* and *Icoplax luminosa*. *Lophochiton granifer* Hull was recorded from this locality, and *Lucilina shirleyi* Ire. also lives there. The *Cryptoplax* proved to be *larvaeformis* Burrow, not *burrowi* Smith. Thus a faunula of eight species is known, but probably more occur, though none, save the rock living *Amphitomura gemmata* Blainville (= *Acanthopleura spiniger* Sow., Hedley) is common.

EXPLANATION OF PLATE XXXV.

- Fig. 1. *Crumenasepia hulliana* Iredale, ventral view.
 2. *Crumenasepia hulliana* Iredale, dorsal view.
 3. *Solitosepia submestus* Iredale, ventral view.
 4. *Solitosepia submestus* Iredale, dorsal view.
 5. *Acanthosepion ellipticum adjaceus* Iredale, ventral view.
 6. *Acanthosepion ellipticum adjaceus* Iredale, dorsal view.
 7. *Ponderisepia eclogaria* Iredale, ventral view.
 8. *Ponderisepia eclogaria* Iredale, dorsal view.
 9. *Metasepia pfefferi laxior* Iredale, dorsal view.
 10. *Metasepia pfefferi laxior* Iredale, ventral view.

THE BIOLOGY OF NORTH-WEST ISLET, CAPRICORN GROUP.

(E.). INSECTS.

By ANTHONY MUSGRAVE, F.E.S.

(By permission of the Trustees of the Australian Museum.)

Plate xxxvi.

Despite the fact that parties have landed on the different islands of the group from time to time, no list of the insects has hitherto appeared, nor have any been recorded. During our stay on North-west Islet, Miss E. Chase, of the University of Sydney, and Mr. Whitley and myself of the Australian Museum, made collections of insects, and these are now deposited in the Macleay and Australian Museums. The number of species secured was small, but many others doubtless exist. Those collected all appear to be well known mainland forms which, in view of the proximity of the Queensland coast, is what one would naturally expect. The insects of the different orders have been submitted to specialists for identification, and I gratefully acknowledge the assistance I have received from those whose names appear in the following list, in association with the names of the insects they have determined.

At the time of our visit, grasshoppers were the most conspicuous and abundant insects, and no plant appeared safe from their attacks. Great damage was done to the leaves of the *Tournefortia argentea*, the plants near our camp being badly attacked so that frequently only the mid-ribs of the leaves remained; a species of fig was similarly affected. The grasshoppers responsible for this destruction were all in immature stages, apparently of the same species, though Miss Chase secured a specimen of *Acridium irregulare*, which might possibly be the adult of the destructive species. Adults of other short-horned grasshoppers were secured, but they were not in any way similar to the injurious forms and were, moreover, fewer in number. Some interesting species of long-horned grasshoppers were also secured on the islet, but these await specific identification. At night, cockroaches invaded the tents in search of food, or lurked by day in the corners of our suit-cases. Two species were present, the widely distributed *Periplaneta americana*, and *Periplaneta australasiae*.

Large black sphegid wasps of the genus *Chlorion* were the next most numerous group of insects on the islet, and these occurred commonly on the flowers of the beach plants, *Tournefortia argentea*, *Scaevola koenigii*, and *Suriana maritima*. Three species were present, and their names appear in the subjoined list. In company with the sphegid wasps was the large yellow and black Sand Wasp, *Salix* (*Priocnemis*) *bicolor*, a widely distributed species. Paper nest wasps, *Polistes bernardii*, built their nests near the camp and daily visited the water-bags in search of moisture.

Cicadas were plentiful and noisy in the Beach Oaks, and some were attracted by the lights in our tents at night. Only one species appears to occur

on the islet, and this has been identified by Mr. Howard Ashton as *Arunta intermedia*. This cicada varied somewhat in colouration, one form having light-brown markings, while in another the markings were green. The species seems to approximate very closely to *Arunta interclusa*, which occurs at Port Curtis.

The common Rice Bug, *Plautia affinis*, which occurs in New South Wales, Queensland, Murray Island, and New Guinea, was also secured, as well as a small reduviid bug at present undetermined.

Butterflies were rare, and were represented only by three forms, the largest being the Tailed Emperor, *Eulepis pyrrhus* subsp. *sempronius*.

Beetles were not numerous in species, only sixteen kinds being collected. Two carabs secured and forwarded to Mr. T. G. Sloane for identification are regarded by him as belonging to the genera *Diaphoromerus* and *Sarothocrepis* and constituting new species, and which he intends describing at some future date.

On the sandy floor of our tent, I secured some tiny weevils, which Mr. Lea has identified as *Mandalotus crassicornis*. A little brown click beetle, *Monocrepidius compactus*, was attracted by the light of our hurricane lamp, and was secured on the sides of the tent in the morning. The largest beetle taken, was a longicorn beetle, *Symphyletes vetustus* var. *anaglyptus*. Some small weevils were bred from *Pisonia* seeds found adhering to the feathers of a White-capped Noddy Tern, and these are considered by Mr. Lea, to whom they were submitted, to belong to the subfamily Cossonides and constitute a new genus and species.

Thirteen species of DIPTERA were secured on the islet, and of these Dr. E. W. Ferguson has been able to specifically identify five, and their names are given in the accompanying list. Robber flies of the genera *Neoitamus* and *Leptogaster* also occurred on the islet, and a species of carrion-fly, *Sarcophaga*.

Class INSECTA.

Order ORTHOPTERA.

Family BLATTIDAE.

PERIPLANETA AMERICANA.

Blatta americana Linné, Syst. Nat. (ed. x.), 1758, 424, No. 4. (America).

Periplaneta americana Lucas, The Entomologist, xxix., 1896, 124, f. 2, on p. 97.

PERIPLANETA AUSTRALASIAE.

Blatta australasiae Fabr., Syst. Ent., 1775, 271, No. 5. (From ships from the Pacific Ocean, Southern Asia, vide Shaw, Proc. Linn. Soc. N.S.W., 1925, 205).

Periplaneta australasiae Lucas, The Entomologist, xxix., 1896, 124, f. 1, on p. 97.

Family ACRIDIDAE.

ACRIDA NASUTA.

Gryllus Acrida nasutus Linné, Syst. Nat. (ed. x.), 1758, 427, No. 11. (Africa).

Acrida nasuta Sjöstedt, Kungl. sv. Vet. Akad. Hand. Bd., 62, 1921, 30, pl. 18, f. 1, 2.

ATRAC TOMORPHEA CRENATICEPS.

Truxalis crenaticeps Blanch, Voy. Pole Sud., Zool. Atlas, Orth., 1853, pl. 3, f. 4, 5. (Triton Bay, New Guinea).

Note.—Identified by Mr. N. B. Tindale, S. Australian Museum.

ACRIDUM IRREGULARE.

Cyrtacanthacris irregularis Walker, Cat. Derm. Salt. Br. Mus., iii., 1870, 569. (Australia).

Acridium irregulare Sjöstedt, Kungl. Sv. Vet. Akad. Hand. Bd., 62, 1921, 260, pl. 15, f. 13, 14; pl. 16, f. 6.

Order HEMIPTERA.

Family PENTATOMIDAE.

PLAUTIA AFFINIS.

Pentatoma affinis Dallas, List, 1851, 252. (Australia).

Plautia affinis Froggatt, Agr. Gaz. N.S.W., xii., 1900, 1595, pl. f. 7.

Family REDUVIIDAE.

One species was secured on North-west Island, but I have been unable to identify it.

Family CICADIDAE.

ARUNTA INTERMEDIA.

Plate xxxvi., fig. 2.

Arunta intermedia Ashton, Proc. Roy. Soc. Vict. (n.s.), xxxiii., 1921, 91. (Cape York, N. Queensland).

Note.—Specimens from North-west Islet submitted to Mr. Howard Ashton have been identified by him as this species, but as there is no figure of the species available I have had one prepared.

Order LEPIDOPTERA.

Family NYMPHALIDAE.

EULEPIS PYRRHUS subsp. *SEMPRONIUS*.

Papilio pyrrhus Linné, Syst. Nat. (ed. x.), 1758, 462, No. 24. (India).

Papilio sempronius Fabricius, Ent. Syst., iii., 1793, 62, No. 194. (Australia).

Eulepis pyrrhus sempronius Waterhouse and Lyell, The Butterflies of Australia, 1914, 51, f. 41.

Family LYCAENIDAE.

CANDALIDES ERINUS.

Papilio erinus Fabricius, Syst. Ent., 1775, 525. (Australia).

Candalides erinus Waterhouse and Lyell, The Butterflies of Australia, 1914, 80, f. 342, 343.

Note.—Identified by Dr. G. A. Waterhouse.

Family HESPERIDAE.

PADRAONA FLAVOVITTATA.

Hesperia flavovittata Latreille, Eneyel. Méthod., ix., 1819, 768. (Australia).

Padraona flavovittata flavovittata Waterhouse and Lyell, The Butterflies of Australia, 1914, 203, f. 859, 866.

Note.—Identified by Dr. G. A. Waterhouse.

Family SPHINGIDAE.

HIPPOTION VELOX.

Sphinx velox Fabr., Ent. Syst., iii. (1), 1793, p. 378, No. 68.

Hippotion velox Rothschild and Jordan, Gen. Insect., fasc. 57, 1907, 132. (Ceylon to Fiji).

Note.—Identified by Dr. A. J. Turner.

Family NOCTUIDAE.

MELANCHRA CONSANGUIS.

Hadena consanguis Guen., Noct., ii., 1852, p. 97.

Polia consanguis Hmps., Cat. Lepid. Phal. Brit. Mus., v., 1905, p. 102, f. 23.

Note.—Identified by Dr. A. J. Turner.

ACANTHOLIPES SIMILIS.

Acantholipes similis Moore, Lep. Atk., 1882, 174, pl. 6, f. 5.

Note.—Identified by Dr. A. J. Turner.

Family EUCOSMIDAE.

EUCOSMA PLEBEIANA.

Crocidosema plebeiana Zeller, Isis, x., 1847, 721.

Eucosma plebeiana Meyrick, Proc. Linn. Soc. N.S. Wales, xxxvi., 1911, 248.

Note.—Identified by Dr. A. J. Turner. "The species occurs now in suitable localities throughout a large part of the globe." *Meyrick*.

Order HYMENOPTERA.

Family PSAMMOCHARIDAE.

SALIUS (PRIOCNEMIS) BICOLOR.

Plate xxxvi., fig. 3.

Sphex bicolor Fabricius, Syst. Entom., 1775, 352, No. 36. (New Holland).

Note.—Identified by Mr. H. Hacker. As a figure of this very common wasp does not appear to be available to Australian entomologists, I have had one prepared.

PSAMMOCHARES FRONTALIS.

Sphex frontalis Fabricius, Syst. Entom., 1775, 349, No. 18. (New Holland).

Note.—Identified by Mr. H. Hacker.

PSAMMOCHARES DODDI.

Anoplius doddi Turner, Proc. Zool. Soc. Lond., 1910, 328. (Townsville, Q.).

Note.—Identified by Mr. H. Hacker.

BATOZONUS VESPOIDES.

Pompilus vespoides Smith, Trans. Ent. Soc. Lond., 1868, 244, No. 8. (Australia).

Note.—Compared with mainland specimens, identified by Mr. H. Hacker.

Family SPHEGIDAE.

CHLORION GILBERTI.

Plate xxxvi., fig. 1.

Sphex gilberti Turner, Proc. Zool. Soc. Lond., ii., 1908, 468. Mackay, Q.).

Note.—Identified by Mr. H. Hacker. As this species has hitherto remained unfigured, I have taken advantage of the opportunity and had a figure prepared. Turner's original colour descriptions reads as follows:—"Black; the abdomen steel-blue. Wings flavo-hyaline, broadly pale fusco-hyaline at the apex; nervures ferruginous." Length of specimen figured 26 mm.

CHLORION FUMIPENNIS.

Sphex fumipennis Smith, Catal. Hymen. Brit. Mus., iv., 1856, 249, No. 44. (Australia, Adelaide).

Note.—Identified by Mr. H. Hacker.

CHLORION (PROTEROSPHEX) RESPLENDENS.

Sphex resplendens Kohl, Termesz. Fuzet., ix., 1883, 2, 200.

Note.—Identified by Mr. H. Hacker.

Family VESPIDAE.

POLISTES BERNARDII.

Polistes bernardii Le Guillou, Ann. Soc. Ent. Fr., 1841, 321, No. 25.

Note.—Identified by Mr. H. Hacker. "An extreme form of *P. variabilis* Saussure."

Family MEGACHILIDAE.

LITHURGUS RUBRICATUS.

Lithurgus rubricatus Smith, Cat. Hym. Brit. Mus., i., 1853, 146. (New Holland).

Note.—Identified by Mr. H. Hacker.

Order COLEOPTERA.

Family HISTERIDAE.

SAPRINUS AUSTRALASIAE.

Saprinus australasiae Blackburn, Trans. Roy. Soc. S. Aust., xxxii., 1903, 107.

Note.—Identified by Mr. A. M. Lea, and compared by him with Blackburn's co-types.

Family ELATERIDAE.

MONOCREPIDIUS COMPACTUS.

Monocrepidius compactus Candeze, Ann. Soc. Ent. Belg., xxi., 1878, lxxix. (Rockhampton).

Note.—Identified by Mr. A. M. Lea.

Family MALACODERMIDAE.

CARPHURUS ARMIPPENNIS.

Carphurus armipennis Fairm., Journ. Mus. Godeffr., xiv., 1879, 109. (Queensland).

Note.—Identified by Mr. A. M. Lea. A specimen is in the Australian Museum collection from Masthead Is. collected by the late Dene B. Fry, October, 1910.

Family CERAMBYCIDAE.

ARIDAEUS THORACICUS.

Clytus thoracicus Donovan, Insects of New Holland, 1805, t. 5, f. 4.

ZYGOCERA PLUMIFERA.

Zygocera plumifera Pascoe, Trans. Ent. Soc. Lond. (2), v., 1859, 33. (Australia, Sydney).

SYMPHYLETES VETUSTUS VAR. ANAGLYPTUS.

Symphyletes vetustus Pascoe, Ann. Mag. Nat. Hist. (3), ix., 1862, 464. (Lizard Is.).

Symphyletes anaglyptus Pascoe, Journ. Linn. Soc. Lond., ix., 1867, 303. (Rockhampton, Q.).

Note.—Identified by Mr. A. M. Lea from specimens named by the Rev. Thomas Blackburn.

Family CURCULIONIDAE.

MANDALOTUS CRASSICORNIS.

Mandalotus crassicornis Lea, Trans. Roy. Soc. S. Aust., xxxi., 1907, 156. (N.S. Wales: Sydney on sea-beaches. Queensland: Brisbane).

Note.—Identified by Mr. A. M. Lea.

NOTIOSOMUS MAJOR.

Notiosomus major Woll., Trans. Ent. Soc. Lond., 1873, 633. (Rockhampton, Q.).

Note.—Identified by Mr. A. M. Lea.

Order DIPTERA.

Family BOMBYLIIDAE.

ANTHRAX ? SIMPLEX.

Anthrax simplex Macquart, Dipt. Exot., Suppl. 2, 52, 76, t. 11, f. 4, 1847. (Tasmania).

Note.—Identified by Dr. E. W. Ferguson.

Family LONCHAEIDAE.

LONCHAEA AUREA.

Lonchoea aurea Macquart, Dipt. exot., Suppl. 4, 300, t. xxviii., f. 1, 1850, (Africa).

Note.—Identified by Dr. E. W. Ferguson.

Family ANTHOMYIDAE.

ANTHOMYIA VICARIANS.

Anthomyia vicarians Schiner, Reise der Novara, Zool., Dipt., 1868, 298. (Sydney).

Note.—Identified by Dr. E. W. Ferguson.

ATHERIGONA EXCISA.

Coenosia excisa Thomson, Eugenes Resa. Insecta, 1868, 560. (Ross Is.).

Atherigona excisa Malloch, Ann. Mag. Nat. Hist. (9), xii., 1923, 185.

Note.—Identified by Dr. E. W. Ferguson. This species, according to Malloch, *supra*, "is the most widely distributed of the genus, occurring in the Hawaiian Islands, Formosa, China, India, Australia, many islands in the Pacific, Africa, and some tropical and subtropical parts of the New World, including Florida. The larvae feed in decaying fruits such as bananas, melon, tomato, etc."

Family MUSCARIDAE.

POGONORTALIS BARBIFERA.

Pogonortalis barbifera, Hendel, Abhandl. Zool.-bot. Ges. Wien., viii., Heft 1, Gen. Insect., xxv., 1914, fasc. 157, p. 85, t. 9, f. 155-156.

Note.—Identified by Dr. E. W. Ferguson.

EXPLANATION OF PLATE XXXVI.

- Fig. 1. *Chlorion gilberti* Turner x 2.
 2. *Arunta intermedia* Ashton x 1.
 3. *Salix (Priocnemis) bicolor* Fabricius x 2.

THE BIOLOGY OF NORTH-WEST ISLET, CAPRICORN GROUP.

(F.). BRYOZOA.

By ARTHUR A. LIVINGSTONE, Assistant in Zoology, The Australian Museum.

(By Permission of the Trustees of the Australian Museum).

ESCHAROIDES DISCUS.

Escharoides discus Kirkpatrick, Ann. Mag. Nat. Hist. (6), i., 1888, p. 82, pl. ix, figs. 6 and 6a-b.

A specimen of the species, which forms the second record of its occurrence, adheres to the disc-like formation of the zoarium as described by Kirkpatrick; it is attached to a fragment of shell and has a major diameter of 4 mm. and a minor diameter of 3 mm. The characters set out by Kirkpatrick are mostly in accordance with the specimen before me, but I cannot detect any traces of avicularia on the frontal zooecial walls. There are, likewise, no oecia. Figure 6b exhibits more likeness than any other to the specimen in the Australian Museum, but, instead of having unarmed blunt process crowning the peristome, the examples before me bear small triangular avicularia on their tips.

Colour.—Pale cream in a dried condition.*Localities*.—Mauritius (Kirkpatrick).

There is a specimen in the Australian Museum from North-west Island, Capricorn Group, Queensland, collected by G. P. Whitley, November, 1925.

PORELLA sp.

An encrusting colony belonging to this genus exhibits characters somewhat in accordance with those possessed by *Mucronella mentalis* MacGillivray (1), though the specimen before me may be distinguished by the following characters. *Porella* sp. is entirely destitute of spines above the aperture. It possesses triangular avicularia, one characteristically set within the proximal border of each zooecial aperture, and the others scattered at random over the surface of the zooecia. *M. mentalis* is considered to be without avicularia.

The specimen before me is also closely allied to *Porella areolata* (2) with which it agrees in most characters. The main difference between these two forms lies in the character of the oecia. The oecia of *Porella* sp. are entirely immersed below the level of the surrounding frontal zooecial walls, whereas in *P. areolata* they are not so. Characteristic features about *Porella* sp. are that the proximal oecial walls are flat and comparatively heavily calcified, and that they each continue downwards for a considerable distance within the zooecial aperture.

Locality.—North-west Island, Capricorn Group, Queensland.

(1) MacGillivray, Trans. Proc. Roy. Soc. Victoria, 1890 (1889), 109, pl. 5. f. 7.

(2) Livingstone, Rec. Austr. Museum, xv., 1926, pl. viii., f. 2-4.

HOLOPORELLA PIGMENTARIA.

Holoporella pigmentaria Waters, Journ. Linn. Soc. Zool., xxxi., 1909, 163, pl. 15, f. 16-19; pl. 16, f. 9-16; pl. 17, f. 22-23.

Specimens from North-west Island are covered in parts with the characteristic pigment. The zooecia are very large in one specimen from a piece of dead coral, while in others they are comparatively small.

SMITTINA LANDSBOROVII.

Lepralia landsborovii Johnston, Hist. British Zoophytes, Ed., ii., 1847, 310, pl. liv., f. 9.

Smittia landsborovii Hincks, Hist. Brit. Mar. Polyzoa, 1880, 341, pl. xlviii., f. 6-9.

Small colonies, which are assigned to this species, were found encrusting shells from North-west Island.

SCHIZOPORELLA AURICULATA.

Lepralia auriculata Hassal, Ann. Mag. Nat. Hist., ix., 1842, 411.

Schizoporella auriculata Hincks, "A History of the British Marine Polyzoa," I., 1880, 260, pl. xxix., f. 3-9.

Juvenile specimens of this species were found encrusting a shell from a lagoon at North-west Island.

CRUSTACEA.

The Crustacea section is omitted from this part through the unfortunate illness of Mr. F. A. McNeill, who is compiling a list of the Decapoda, supplemented by a few species of other Crustacea determined by Dr. Chas. Chilton, N.Z., and Mr. Herbert M. Hale, of the South Australian Museum. This report will appear in the next part of the Australian Zoologist.

THE BIOLOGY OF NORTH-WEST ISLET, CAPRICORN GROUP.

(G.). CORALS.

By CHARLES HEDLEY, F.L.S.

Collections of corals were made at North-west Islet by Miss E. Chase and Mr. A. Musgrave, but these include only a small proportion of the species recorded from the Capricorn Islands. I have collected many species at North-west Islet not represented among those brought back by the party. Below is a list of the species determined, with a reference to the source of each identification.

Class ANTHOZOA.

Subclass ZOANTHARIA.

Family SERIATOPORIDAE.

SERIATOPORA HYSTRIX.

Seriatopora hystrix Dana, U.S. Expl. Exped., Zooph., 1846, 521, pl. 19, f. 3, 3a, 3b. (Fiji Islands).

Seriatopora hystrix Vaughan, Carnegie Inst. Pub. No. 213, 1918, 73, pl. 20, f. 1, 1a, 1b, 1c, 2, 2a, of Dana's type. Also pl. 2, f. 4, of Dr. Mayer's article.

POCILLOPORA BULBOSA.

Pocillopora bulbosa Ehrenberg, Corall. des rothen Meeres, 1834, 127. (Red Sea).

Pocillopora bulbosa Vaughan, Carnegie Inst. Pub. No. 213, 1918, 75, pl. 21, 1, 1a, specimens identified as *P. bulbosa* by Dana. Also pl. 12, f. 1, 2, 3, of Dr. Mayer's article.

Family STYLOPHORIDAE.

STYLOPHORA PISTILLATA.

Madrepora pistillata Esper. pflanz., t. I., Forts., 1787, 73, Madr., pl. 60.

Stylophora pistillata Vaughan, Carnegie Inst. Wash., Pub. No. 213, 1918, 80, pl. 26, f. 1, 1a, specimen from Murray Island. Also pl. 18, f. 40, of Dr. Mayer's article.

Family FAVIIDAE.

GONIASTREA PECTINATA.

Astraea pectinata Ehrenberg, Corall. des rothen Meeres, 1834, 96. (Red Sea).

Goniastrea pectinata Vaughan, Carnegie Inst. Wash., Pub. No. 213, 1918, 114, pl. 43, f. 1, Dana's type of *Astraea sinuosa*; f. 2, 3, 3a, 4, 5, 5a, specimens from Murray Island.

Family FUNGIIDAE.

FUNGIA SCUTARIA.

Fungia scutaria Lamarek, Hist. Nat. Anim. sans Vert., t. ii., 1816, 236. (Indian Seas).

Fungia scutaria Vaughan, U.S. Nat. Mus. Bull. No. 59, 1903, 131, pl. 28, f. 3, 3a, 3b, pls. 29, 30, 31, 32 (all figs.).

Note.—New for Australia.

Family AGARICIIDAE.

PSAMMOCORA GONAGRA.

Psammocora gonagra Klunzinger, Korall. Roth. Meer., pt. 3, 1879, 80, pl. 9, f. 1. (Red Sea).

Psammocora gonagra Vaughan, Carnegie Inst. Wash., Pub. No. 213, 1918, 141, pl. 59, f. 1, specimen from Murray Island. Also pl. 18, f. 43, of Dr. Mayer's article.

Family ACROPORIDAE.

ACROPORA DECIPiens.

Madrepora decipiens Brook, Ann. Mag. Nat. Hist., x., 1892, 456. (Rocky Island Reefs).

Madrepora decipiens Brook, Cat. Mad. Corals Brit. Mus., I., 1893, 51, pl. xiv., f. B.-D.

ACROPORA ABROTANOIDES.

Madrepora muricata Solander & Ellis, 1786, pl. 57, *nec* Linne.

Madrepora abrotanoides Lamarek, Hist. Anim. sans Vert., t. ii., 1816, 280 (ed. ii., 448). (Indian Ocean).

Acropora (Eumadrepora) abrotanoides Vaughan, Carnegie Inst. Wash., Pub. No. 213, 1918, 166, pl. 68, f. 1, 1a, 2.

ACROPORA SURCULOSA.

Madrepora surculosa Dana, U.S. Expl. Exped., Zooph., 1846, 445, pl. xxxii., f. 4, 5.

ACROPORA BRUEGGEMANNI.

Madrepora brueggemanni Brook, Cat. Mad. Corals Brit. Mus., I., 1893, 145, pl. xxiv. (Singapore).

ACROPORA BAEODACTYLA.

Madrepora baeodactyla Brook, Ann. Mag. Nat. Hist., x., 1892, 453. (Rodriguez).

Madrepora baeodactyla Brook, Cat. Mad. Corals Brit. Mus., I., 1893, 158, pl. xiii., f. A, B.

Family PORITIDAE.

GONIOPORA TENUIDENS.

Rhodaraca tenuidens Quelch, Reef Corals, Challenger Reports, 1886, 188, pl. 8, f. 7, 7a, 7b.

Goniopora tenuidens Vaughan, Carnegie Inst. Wash. Pub. No. 213, 1918, 186, pl. 84, f. 1, 2.

PORITES sp.

Subclass ALCYONARIA.

Family TUBIPORIDAE.

TUBIPORA MUSICA.

Tubipora musica Linne, Syst. Nat. ed. x., 1758, 789. (Indian Seas).

THE BIOLOGY OF NORTH-WEST ISLET, CAPRICORN GROUP.

(H.). BOTANY.

List of Plants collected, identified by C. T. WHITE, Government Botanist, Brisbane;
with notes by DR. W. MACGILLIVRAY.

Order MALVACEAE.

Abutilon graveolens W. & Arn.

At back of outer zone. Fruit three-cornered.

Order ZYGOPHYLLACEAE.

Tribulus cistoides Linné.

Order SIMARUBEAE.

Suriana maritima Linné.

Bushy shrub of outer zone. Small leaves and small whitish flowers much resorted to by wasps. Only previously recorded from Torres Strait.

Order OLACINEAE.

Ximenia americana Linné.

Tree. No fruit or flowers. "Yellow plum" of Hammond Island; also on Dunk Is. and Bellenden Ker. "So far as can be determined by leaf specimens only."

Order LEGUMINOSAE.

Caesalpinia bonducella Flem.

Strongly-growing climber; bipinnate leaves and recurved thorns in pairs; bright green foliage; no flowers or fruit. Only one plant found at, or just by, nest of Currawong (*Strepera graculina*) found by Miss Geissmann in centre of islet. "Kernels of seeds are the nickernuts of India. Prickly pods and blue or slate-coloured seeds used for ornamental purposes." No sign of seeds under plant on islet, probably eaten by fowls.

Sophora tomentosa Linné.

Sea coast Laburnum. Not flowering nor seeding.

Order COMPOSITAE.

Wedelia biflora D.C.

Prevalent. Trailing yellow-flowering plant.

Gnaphalium luteoalbum Linné.

Dried or half-dried specimens in outer border only.

Order GOODENOVIÆAE. Section *Sarcocarpææ*.

Scaevola Koenigii Vahl.

Called "Native Cabbage" at Cardwell. "Pith of stems used in Asia in the manufacture of artificial flowers." Bailey.

Order BORAGINEAE. Section *Heliotropiææ*.

Tournefortia argentea Linné.

Common bush with silvery leaves about our camp; flowers; fruit small greenish-yellow berries used as food by *Zosterops lateralis*.

Order CONVOLULACEAE. Series *Calycinae*.

Ipomoea grandiflora Linné.

Common in centre of islet. Strong climber.

Series *Speciosæ*.

Ipomoea pes-caprae Roth.

More of a trailer in outer zone of vegetation.

Order NYCTAGINEAE.

Pisonia brunomiana Endl.

No seed-pods were brought back, but they were seen many times on the tree and seemed identical with those on the Noddies. Leaves only brought back.

Boerhavia diffusa Linné.

"Hagweed." Training plant forming masses 2 feet in height and often supporting itself on logs and stumps. Plentiful in rocky parts of islet towards the east side.

Order AMARANTACEAE.

Achyranthes aspera Linné.

"Washerman's plant of India." Bailey.

Order LAURINEAE.

Cassytha filiformis Linné.

Draping many of the shrubs of the outer zone.

Order EUPHORBIACEAE. Section i. *Anisophyllum*.*Euphorbia atoto* Forst.Section ii. *Eremophila*.*Euphorbia eremophila* A. Cunn.

Sheep poison or Caustic plant. Common about Broken Hill, grows in crab holes in Salt-bush Plain. On the islet, both these plants grew in the outer zone of vegetation, often on outer edge and often close together.

Order URTICACEAE.

Ficus platypoda A. Cunn. var. *petiolaris* Benthām.

Smooth leaves, small black fig when ripe; grows into a large tree.

Ficus opposita Miq.

Rough veined leaves. Red fig when ripe.

Pipturus argenteus Wedd.

Stringy seed heads. Small tree in scrub with silvery under-surface to leaves.

Celtis paniculata Planch.

Bushy green tree at or about edge of scrub. No flowers or fruit available. "Investigator Tree."

Order CASUARINEAE.

Casuarina equisetifolia Forst.

This tree grows only on outer border of outer zone.

Order PANDANACEAE.

Pandanus pedunculatus R.Br.

On all islands visited; forming a dense community on Wilson Is.

Order GRAMINEAE.

Thuarea sarmentosa Pers.

Sand-binding, creeping grass on outer or shore edge of outer zone. "Beach Grass."

Sporobolus virginicus Kunth.

Coarse grass all over outer zone all about our camp. A coastal grass growing on brackish soil.

Spinifex hirsutus Labill. (Identified from description only).

Grass with spiny heads which blow about. Common on south-west side of islet, about Casuarinas.

THE BIOLOGY OF NORTH-WEST ISLET, CAPRICORN GROUP.

(I.). BIBLIOGRAPHY.

By ANTHONY MUSGRAVE, F.E.S.

In compiling this bibliography, I have been greatly assisted by Mr. Charles Hedley, who has kindly supplied me with a number of references for a basis upon which to work. Mr. Tom Iredale and Mr. G. P. Whitley have also assisted by drawing my attention to references overlooked.

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- , A Revision of the Australian Turridae. *Rec. Austr. Mus.*, xiii., 1922, 213-359, pls. xlii.-lvi., text-figs. 1-15. Records several species from the Capricorn Islands.
- , Some Naticoids from Queensland. *Rec. Austr. Mus.*, xiv., 1924, 156. *Uber flemingianum* Recluz is recorded from Masthead Island.
- Hedley, C. and Taylor, T. G.—Coral Reefs of the Great Barrier, Queensland. A Study of their Structure, Life-distribution, and relation to Mainland Physiography. Section C. *Austr. Assoc. Adv. Sci.*, Adelaide, 1907 (1908), xi., 397-413. Six blocks and three plates.
- Iredale, T.—Cuttle-fish "Bones" of Sydney Beaches. *Australian Zoologist*, iv., 1926, 191, pl. xxii., f. 7-8. A new species, *Glyptosepia opipara*, is recorded from Masthead Is., collected by Mr. Hedley.
- Iredale, T. and Hull, A. F. Basset.—A Monograph of the Australian Loricates. (Phylum Mollusca—Order Loricata). No. iv. *Austr. Zool.*, iii., 1925, 339-361, pls. xxxix.-xl. Three new species are recorded from the Capricorn Group, viz.: *Parachiton capricornicus*, *Icoplax luminosa*, *Callistelasma generos*, in addition to *Lophochiton granifer* Hull.

- , *Id.* No. v. *Austr. Zool.*, iv., 1925, 80 and 101. Two species are recorded from the Capricorn Group, *Acanthochiton shirleyi* Ashby, and *Cryptoplax larvæformis* Burrow.
- Johnston, T. H.—A Census of the Endoparasites recorded as occurring in Queensland, arranged under their hosts. *Proc. Roy. Soc. Q'land.*, xxviii., 1916, 31-79. Parasites on *Chelonia mydas* from Masthead Island, and a parasite from a kingfisher from Masthead Island, are listed.
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- Jukes, J. B.—Voyage of H.M.S. "Fly." i., 1847. Chapter i. The first account of the Group to be published by a Naturalist.
- Livingstone, A. A.—Studies on Australian Bryozoa. No. 1. *Rec. Austr. Mus.*, xiv., 1924, 189-212, pls. xxiii-xxvi., text-fig. i. Two species *Parmularia integer* and *P. macneilli* from the lagoon at Masthead Island, collected by Mr. C. Hedley and Mr. A. R. McCulloch in October, 1904, are recorded as new.
- Longman, H.—The Plants of Masthead Island. *Proc. Roy. Soc. Q'land.*, xxv., 1914, 17-23.
- McCulloch, A. R.—Studies in Australian Crustacea. No. 3. *Rec. Austr. Mus.*, ix., 1913, 349, pl. xi., fig. i. *Clibanarius taeniatus* Miln.-Edw. recorded from Masthead Island.
- McCulloch, A. R. and Whitley, G. P.—A List of the Fishes recorded from Queensland Waters. *Mem. Q'land Mus.*, viii., 1925, 125-182.
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Two species recorded from North-west Islet.
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- , The Naturalist in Australia, 1897.
- Shirley, J.—Shells from North-west Islet, collected by Miss Peberdy. *Proc. Roy. Soc. Q'land.*, xxvii., 1915, Abstract of Proceedings, p. x.
- Wilsmore, L. J.—On Some Zoantheae from Queensland and the New Hebrides. *Journ. Linn. Soc. Lond.*, xxx., 1909, 320-324, pls. 43-45.
Two new species, *Zoanthus pigmentarius*, and *Gemmaria arenacea*, are recorded from Masthead Island, collected by Mr. C. Hedley's party in 1904.

A MONOGRAPH OF THE AUSTRALIAN LORICATES.

(Phylum MOLLUSCA—Order LORICATA).

By TOM IREDALE and A. F. BASSET HULL.

VII.

Genus AMAUROCHITON.

Amaurochiton Thiele, Das Gebiss der Schnecken (Troschel), ii., 1893, 362. Type by monotypy *Chiton olivaceus* Frembly.

Poeciloplax Thiele, id. ib., 365. Type by monotypy *Chiton glaucus* Gray.

The peculiar sculpture determines this genus at sight, and with it is associated the form of the girdle scales, which are rather large and rudely convex, closely imbricating and nearly smooth. The insertion plates are very short, finely pectinated, as is the sinus. The slitting of the anterior and posterior valves is numerous, 9 or 10—14, but only one slit is seen on each side of the median valves.

A well-marked group, localised in New Zealand and the west coast of South America. It is included here, as it is now established in southern Tasmania.

AMAUROCHITON GLAUCUS.

Plate xxxvii., figs. 1, 22.

Chiton glaucus Gray, Spicilegia Zoologica, pt. i., 1828, 5. Locality unknown = New Zealand. Type in British Museum examined.

Chiton viridis Quoy & Gaimard, Voy. de l'Astrol. Zool., iii., 1835, 383, pl. 74, f. 23-28. New Zealand. Type in Brit. Mus. Not *Chiton viridis* Spengler, Skrivter af Naturhistorie-Selskabet., iv., 1797, 70.

Chiton quoyi Deshayes, Hist. Nat. Anim. sans Verteb., vii., 1836, 509. New name for *C. viridis* Q. & G. Pilsbry, Man. Conch., xiv., 1893, 172, pl. 37, f. 6-8.

Chiton quoyi subsp. *limosa* Suter, Journ. Malac., xii., 1905, 69. Manukau Harbour, North Island, New Zealand. Type in coll. Suter.

Amaurochiton glaucus Iredale, Proc. Mal. Soc., xi., 1914, 38, footnote. May, Illus. Index Tas. Shells, 1923, pl. xvi., f. 13.

Shell large, broadly oval, a little elevated, semi-carinated; the surface very finely striate throughout but presenting a glossy appearance; girdle scales shining. Colour generally dark bluish-green, but pale green, bright blue, red-brown, and white examples may be met with; generally unicolour, but a green or brown shell striped with white is common at certain localities.

Anterior valve very broad, radially rayed with 80-100 delicate ridges; in juvenile shells these ridges can be seen to be composed of small nodules strung together and coalescing with age.

Median valves with lateral areas a little elevated, similarly rayed with 20 ridges increasing by intercalation with age; central areas closely lined with similar ridges longitudinally arranged, a little slanting laterally and present on the jugum, 80-100 being counted across the valve.

Posterior valve with mucro at anterior third; post-mucronal slope nearly straight; post-mucronal area as anterior valve; ante-mucronal area as central areas.

Girdle covered with smooth squarish diamond-headed scales, somewhat resembling those of *Ischnoradsia*.

Interior generally bluish-green, but varying a little, according to exterior colouration. Slits 9-10-1-14-15.

Dimensions: 45 x 30 mm.

Station: Under stones between tide marks.

Habitat: Southern Tasmania, apparently introduced from New Zealand.

Genus *SYPHAROCHITON*.

Sypharochiton Thiele, Das Gebiss der Schnecken, ii., 1893, 365. Type by monotypy *Chiton pelliserpentis* Quoy & Gaimard. (Voy. Astrol. Zool., 1835, 381).*

Triboplax Thiele, id. ib. Type by monotypy *T. scabricula* = *pelliserpentis* Q. & G.

Another well-marked group, endemic in Eastern Australia from Port Stephens, to Montague Island, New South Wales, and on the east and north coasts of Tasmania; abundant throughout New Zealand, with small forms at the Kermadec, Lord Howe and Norfolk Islands.

Shell large to small, oval, round-backed, not much elevated, sculptured with coarse nodulose radials and fine longitudinals; girdle having coarse striate scales loosely packed. Insertion plates in all valves, strongly toothed; slits in anterior valve regularly more than 8, median 1, posterior 12; sinus toothed in second valve only, otherwise not denticulate though plate present; posterior insertion plate tending forward. The small forms may be distinguished by the degeneration of the teeth, and should constitute a subgenus.

SYPHAROCHITON SEPTENTRIONES.

Plate xxxvii., figs. 2, 4, 29.

Sypharochiton pellis-serpentis subsp. *septriones* Ashby, Trans. Roy. Soc. S. Aust., xlviii., 1925, 321. New South Wales. Type in coll. Ashby.

Chiton pellis-serpentis Cox, Proc. Linn. Soc. N.S.W., viii., 1894, 428. Port Jackson and Port Hacking, N.S.W.

Shell large, oval, elevated, round-backed; colour generally dark brown or black, but many may be found with one or more valves wholly or partly pale green or white.

Anterior valve strongly nodulose, nodules in rays and cut by concentric growth lines; twenty to thirty radials having ten to fifteen nodules to each radial.

Median valves with lateral areas well raised and similarly sculptured, but not so prominently; pleural areas closely ridged longitudinally throughout, interstices latticed, weaker on the jugum; sometimes notably sculptured with growth lines.

Posterior valve with mucro elevated at anterior fourth; post-mucronal slope straight.

Girdle scales large, oval, closely striate, not shining.

Interior bluish-green, deeper medially. Slitting 11-1-14.

Dimensions: 42 x 28 mm.

Station: On the surface of the littoral rock, in crevices, or in depressions above median tide mark; less frequently, and generally in juvenile stages, under stones below median tide mark. This is one of the emergent species, and examples are often found above neap high water mark. Nearly all adult examples are greatly eroded or overgrown with parasitic algae.

* Note:—Quoy and Gaimard named this shell "*pelliserpentis*" (Peau-de-serpent). Numerous writers have altered the spelling to either "*pelliserpentis*" or "*pellis-serpentis*." We use the authors' spelling.

Habitat: New South Wales.

Remarks: *S. maueanus* attains larger proportions, is more elongate, and more elevated; the sculpture is less pronounced, the girdle scales less strongly striate, shining. The New Zealand *S. pelliserpentis* Q. & G. is distinguishable from the New South Wales shell by its more elongate shape, less pronounced pleural sculpture, and the very weak striation of the girdle scales, which also are not shining. *S. sinclairi* Gray has finely striate, shining girdle scales; the pleural areas are smooth or with short longitudinal grooves.

SYPHAROCHITON MAUEANUS.

Plate xxxvii., fig. 3.

Sypharochiton maueanus Iredale & May, Proc. Mal. Soc., xii., 1916, 114, pl. v., f. 5. Port Arthur, Southern Tasmania. Type in Tasmanian Museum.

Sypharochiton pellis-serpentis Quoy & Gaimard: Ashby, Trans. Roy. Soc. S. Aust., xlv., 1922, 20. (Includes *S. sinclairi* Gray!). (Not *Chiton pelliserpentis* Quoy & Gaimard). May, Illus. Index Tas. Shells, 1923, pl. xvi., f. 12.

Shell large, elevated, carinated, side slopes convex. Colour generally dark to blackish brown, but frequently with valve ii. wholly black, the jugum black, and the other valves yellowish-white, sometimes flamed with black.

This shell differs from *S. septentriones* in the larger size, more oval shape, weaker sculpture, more weakly striate and glossy girdle scales. The variation in sculpture was commented on by Iredale and May, and more material has shown this variation to be a marked feature of the southern Tasmanian species, hence the reports of *S. sinclairi* from that locality. The species, further, in comparison with the New South Wales species, is more elevated, with the mucro more central, more elevated, and consequently the post-mucronal area is more pronounced.

Interior: Greenish, darker medially. Slits 10-11—1—12-14.

Dimensions: 63 x 35 mm. (dried).

Station: This species appears to frequent the water much more than the Peronian shell which, like the New Zealand species, lives near or even above high water mark. Hence, while the two latter are generally represented by eroded shells, the former can be procured in fine, bright specimens with little or no erosion.

Remarks: Examples from the north coast of Tasmania are generally smaller and more elevated; the sculpture bolder and more like the New Zealand species. No examples have been taken in Victoria nor in Twofold Bay, New South Wales, the Peronian species appearing to die out about Montague Island.

SYPHAROCHITON MAYI.

Plate xxxvii., figs. 6, 7, 8.

Ischnochiton (Haploplax) mayi Pilsbry, Nautilus, viii., 1895, 128. Eagle Hawk Neck, East Coast, Tasmania. Type in Acad. Philad.

Ischnochiton mayi Hedley & Hull, Rec. Aust. Mus., vii., 1909, 264, pl. lxxiv., f. 28. May, Illus. Index Tas. Shells, 1923, pl. xiv., f. 13.

Ischnochiton (Haploplax) mayi var. *viridis* Ashby, Trans. Roy. Soc. S. Aust., xlv., 1920, 264, pl. xi., f. 2. D'Entrecasteaux Channel, Tasmania.

Shell small, rounded oval, semi-carinated, side slopes curved, valves beaked. Colour black, pale green with black girdle (var. *viridis* Ashby).

Anterior valve finely quincuncially punctate, developing into small tubercles arranged concentrically, not radially, towards the margin.

Median valves with central areas finely quincuncially punctate, fine lines suggested towards the edge; lateral areas raised, similarly sculptured, but

tubercles developing towards the edge and massed by growth lines, more prominent with age.

Posterior valve with mucro ante-median; ante-mucronal area quineuncially punctate; post-mucronal area showing small tubercles arranged concentrically, but not so marked as on the anterior valve.

Girdle broad, covered with small, rounded, rather coarse scales, finely striate with six to eight shallow grooves.

Interior blue; slits 10-1-12, teeth degenerate, pectination obsolete.

Dimensions: 20 x 12 mm.

Station: Under or upon stones above median tide mark.

Habitat: Tasmania (Port Arthur, D'Entrecasteaux Channel, Frederick Henry Bay, Maria Island, Tamar Heads).

Remarks: May & Torr (Pap. and Proc. Roy. Soc. Tas., 1912, 31), give the general dimensions as "breadth is three-fourths of the length," but none of our dried examples is relatively as broad.

Genus SQUAMOPLEURA.

Squamopleura Nierstrasz, Siboga Expeditie (Der Chitonen) Mon., xlviii, 1905, 102. Type by monotypy *Squamopleura imitator* Nierstrasz from Java, a species of *Sclerochiton* preoccupied.

Sclerochiton Dall, Proc. U.S. Nat. Mus., 1881, 287, 289, ex Cpr. M.S. Nom. nud. Pilsbry, Man. Conch., xiv., 1893, 188, ex Cpr. M.S. Type by monotypy *Chiton miles* Pilsbry, ex Cpr. M.S. Not *Sclerochiton* Kraatz, Wiegmann's Archiv. fur Naturg., xxv., 1859, 133.

This group seems to be related to *Sypharochiton*, and also to *Liolophura*, but in the type species the sculpture is like that of the latter, while in another series it is different, though not like that of the former.

Shells medium to large, oval, round-backed, depressed, sculpture coarse, nodulose radials and longitudinal nodulose ribs; girdle scales small, loosely packed, striate; anterior insertion plate short, sharply denticulate, eight-slit; median valve similarly denticulate, one-slit, sinus with a projecting wedge not denticulate; posterior insertion plate reduced almost to a callus, but finely toothed. sometimes two well-developed slits at the sides, but the intermediate slitting is indistinct.

SQUAMOPLEURA CURTISIANA.

Plate xxxvii., figs. 5, 26, 27.

Chiton (Ischnochiton) curtisianus Smith, Zool. Coll. Alert, 1884, 78, pl. vi., f. D. Port Curtis, Queensland. Type in Brit. Mus.

Ischnochiton curtisianus Pilsbry, Man. Conch., xiv., 1892, 97, pl. 24, f. 6.

Enoplochiton torri Bastow & Gatliff, Proc. Roy. Soc. Vict., xx., 1907, 27, pl. iii. & iv. Queensland.

Sclerochiton aruensis Thiele, Revision Chitonen (Chun's Zoologica, Heft 56), 1910, 96, pl. x., f. 36-41. Type in Berlin Museum.

Liolophura curtisiana Pilsbry, Man. Conch., xiv., 1893, 242. Hedley & Hull, Rec. Aust. Mus., vii., 1909, 265.

Sclerochiton curtisianus Iredale, Proc. Mal. Soc., ix., 1910, 103.

Shell medium, depressed, round-backed, oval; sculpture notable; girdle with very small scales. Colour dull brown or olive green with wedge-shaped black markings on the jugum.

Anterior valve closely covered with small rounded nodules of different sizes, not arranged in rows; strong concentric growth lines present; numerous black eyes are irregularly distributed.

Median valves with lateral areas scarcely raised, similarly sculptured; pleural areas sculptured with longitudinal rows of nodules, about twelve distinct on each

side, then massed and indistinct over the jugum; growth lines, marked with age.

Posterior valve with mucro little elevated, sub-central; post-mucronal slope straight; post-mucronal area sculptured as anterior valve; ante-mucronal area as pleural area.

Girdle moderately broad, covered with very small, numerous scales, loosely packed, striate.

Interior bluish, medially blotched with purple. Slits 8-1-2. Callus regularly striate.

Dimensions: 16 mm. long (type), 24 x 16 mm. (Anson Bay, Northern Territory).

Station: On the upper side of stones in mud and on the piles of the wharf at Port Curtis, in the attached valves of dead oysters or in the interstices between clumps of that shell; on the outside of littoral rocks (Port Denison), amongst oysters on the hull of an iron ship wrecked at Magnetic Island, Queensland; and on the stones of a breakwater at Redcliff, Brisbane River.

Habitat: Queensland, from Brisbane to Cape York; Northern Territory, Point Torment, North Western Australia.

SQUAMOPLEURA CARTERI, n.sp.

Plate xxxvii., figs. 18, 20, 28.

Sclerochiton curtisianus Smith, Ashby, Proc. Roy. Soc. West. Aust., viii., 1923, 34. Point Cloates, W.A. Not of Smith *supra*.

Sclerochiton miles Pilsbry, Ashby, Trans. Roy. Soc. S. Aust., xlvii., 1923, 231, pl. xviii., f. 3 a-d. Carnarvon, W.A. Not of Pilsbry *infra*.

[*Sclerochiton thielei* Ashby, id. ib., 233, Sumatra, is an absolute synonym of *Squamopleura imitator* Nierstrasz, Siboga Expeditie, xlviii., 1905, 102, f. 212-218. Java].

Shell large, round-backed, broadly oval, depressed, sculpture weak, girdle with small scales. Colour yellowish-green, with brown stripe on the jugum.

Anterior valve broad, closely covered with fine nodules, and showing concentric growth lines.

Median valves with laterals a little raised, sculptured with nodules as anterior valve; pleural areas marked with fine transverse lines, a few wrinkled longitudinalinals at the edge.

Posterior valve with mucro depressed, submedian.

Girdle scales small, loosely packed, striate, larger than those of *S. curtisiana*.

Interior bluish, medially blotched with purple. Slits 8-1-2. Callus coarsely striate.

Dimensions: 40 x 20 mm.

Station: On the upper side of flat littoral rocks near high water mark.

Habitat: Point Cloates, North Western Australia.

Remarks: The type of this species, collected by Mr. Tom Carter, is in the Western Australian Museum. Ashby recorded the species as *S. miles* which, however, it does not resemble, but agrees more closely with the form he has called *S. thielei*, which is identical with *S. imitator* Nierstrasz. It is interesting to find the range of the forms concurrent, so that we may suggest different origin, and that this species, and *S. imitator*, go together. Showing the sculpture of *Liolophura* and *Clavarizona*, they may be more closely allied to those genera; while *S. curtisiana* may be near *Sypharochiton*.

[*SQUAMOPLEURA MILES*.

Chiton (Sclerochiton) miles Pilsbry, Man. Conch., xiv., 1893, 189, pl. 46, f. 1-5.

Torres Strait. Mus. Cuming in Brit. Mus.

Ischnochiton araucarianus Hedley, Proc. Linn. Soc. N.S.W., xxiii., 1900, 100, fig.

in text. Isle of Pines, New Caledonia.

Paratypes of *arauccarianus* were compared by Iredale with the type of *miles* in the British Museum, and he noted "the type of *miles* is smaller, the scales are more closely packed, probably through drying; same irregularity in size, and similarly striated; both worn, but sculpture similar; would not separate them." Hull has collected a series on the Islands of the Loyalty group, and a further comparison of these reveals no characters that can be utilised for separation. *S. miles* may be removed from the Australian list, the locality cited (Torres Strait) being erroneous; the type was probably collected by Macgillivray at the Island of Pines].

Genus CLAVARIZONA.

Clavarizona Hull, Aust. Zool., iii., 1923, 199. Type by original designation *Chiton hirtosus* Blainville.

Similar to *Liolophura*, excepting the girdle covering, which consists of short, obtuse, striated scales, resembling the heads of aboriginal clubs or nulla nullas.

CLAVARIZONA HIRTOSA.

Plate xxxvii., figs. 9-12, 17, 21.

Chiton hirtosus Blainville, Dict. Sci. Nat. (Levrault), xxxvi., 1825, 546 (ex Peron M.S.). Seas of King Island, error = King George Sound, South Western Australia. Type in Paris Mus.

Chiton georgianus Quoy & Gaimard, Voy. Astrolabe, Zool., iii., 1835, 379, pl. 75, f. 25-30. King George Sound, South Western Australia. Type in Paris Mus.

Liolophura georgiana Pilsbry, Man. Conch., xiv., 1893, 241, pl. 53, f. 36-40.

Acanthopleura (Liolophura) georgiana Thiele, Fauna Sud.-West. Aust., 1911, 399.

Plaxiphora pustulosa Torr, Trans. Roy. Soc. S. Aust., xxxv., 1911, 107, pl. xxv., f. 7. Albany, South Western Australia (founded on a valve). Type in coll. Torr.

Clavarizona hirtosa Hull, Aust. Zool., iii., 1923, 199, pl. xxviii., f. 9-12.

Shell large, broadly oval, moderately carinated, side slopes convex. Colour olive-green, brown or black, the two former generally having the dorsal area darker in a series of V-shaped markings, the black shells occasionally exhibiting on one or more of the median valves white patches which extend to the adjacent parts of the girdle.

Anterior valve crowded with oval tubercles, irregularly radiating towards the margin; several concentric growth lines causing undulation of the surface.

Median valves with lateral areas strongly differentiated, sculptured with eight or more radiating rows of elongated polished tubercles: central areas with numerous wavy concentric lines over the dorsal area, and breaking up into large oblong tubercles becoming more pronounced towards the margins. Valve ii. also shows three or more vertical lines on the dorsal area, crossing the wavy lines and converging posteriorly.

Posterior valve with projecting terminal mucro, the large ante-mucronal area sculptured similarly to the central areas of the median valves; the post-mucronal area almost recurved, and sculptured with a few elongate tubercles.

All valves with numerous ocelli, scattered on valve i., and chiefly along the diagonal in two or more rows in valves ii. to viii.

Girdle densely clothed with short obtuse or conical striated scales; colour generally in bands of white and black alternating, the portions in front of the anterior and behind the posterior valves being white.

Interior purple-brown, sutural laminae whitish. Anterior valve with 10 slits, median valves 1-slit; all insertion plates deeply pectinated; posterior valve with broad rough callus.

Dimensions: 60 x 35 mm. (dried shell).

Station: On the surface or in crevices of the rocks between high spring and mean tide marks. Juveniles are sometimes found under stones.

Habitat: South Western Australia.

Genus LIOLOPHURA.

Liolophura Pilsbry, Nautilus, vi., 1893, 105. Type by original designation *Chiton japonicus* Lischke.

Liopleura Cox, P.L.S., N.S.W., ser. 2, viii., 1893, 426.

Valves exposed, dull and somewhat roughened, generally eroded outside, with minute eyes irregularly scattered over the lateral areas, the head-valve and the sides of the central areas. Interior dark coloured, having anterior and side insertion-plates slit into teeth and sharply pectinated outside; posterior valve with posterior terminal mucro, lacking the insertion-plate, which is represented by a flat callous ledge. Girdle covered with stout calcareous spines of varying sizes.

LIOLOPHURA GAIMARDI.

Plate xxxvii., figs. 13-16, 19, 31.

Chiton gaimardi Blainville, Dict. Sci. Nat. (Levrault), xxxvi., 1825, 546. Port Jackson, New South Wales. Type in Paris Mus.

Chiton incanus Gould, Proc. Bost. Soc. Nat. Hist., ii., 1846, 145, New South Wales. Type in Philad. Acad. United States Expl. Exped. Moll., 315. Atlas, pl. 28, f. 432, 432a.

Maugeria incanus Gould, Otia Conch., 1862, 248.

Acanthopleura incana Smith, Zool. Coll. Alert, 1884, 81. Haddon, Zool. Challenger, xv., 1886, Polypl., 25.

Liolophura gaimardi Pilsbry, Man. Conch., xiv., 1893, 240, pl. 53, f. 30-35. Hull, Aust. Zool., iii., 1923, 198, pl. xxviii., f. 1-4.

Shell the smallest of the genus; broadly oval, depressed, round-backed, valves beaked. Colour greenish-grey to blackish-brown, with a V-shaped black marking on the jugum of valves ii. to viii.

The sculpture of all valves consists of wavy, concentric, nodulose ridges, the nodules becoming more pronounced towards the margins; lateral areas not very clearly differentiated.

Posterior valve with mucro post-median, post-mucronal slope concave.

Girdle alternately black and white barred, densely covered with calcareous spines of three distinct forms: (a) small, pebbly, rounded, irregular scales, (b) larger conical truncated spines, (c) long, pointed, slightly curved spines.

Interior dull purple, sutural laminae white.

Dimensions: 45 x 25 mm. Slits: 10-11—1—0.

Station: On the upper surface of rocks, in crevices, and on the dead shells of rock oysters, between high water and median tide mark.

Habitat: New South Wales, from Port Hacking to Broken Bay (about 40 miles of coast line from point to point, not including some hundreds of miles of indentations of the four harbours opening on to the coast).

Remarks: Very common in Port Jackson and Broken Bay, but rare on the ocean front. Valves nearly always eroded, even in very young examples. It is quite possible that this species may be yet found outside the very limited habitat abovementioned.

LILOPHURA QUEENSLANDICA.

Plate xxxvii., figs. 23-25, 30, 32.

Liolophura gaimardi queenslandica Pilsbry, Proc. Acad. Nat. Sci. Philad., 1894, 87. Bundaberg, Queensland. Type in Philad. Acad.

Liolophura queenslandica Hull, Aust. Zool., iii., 1923, 199, pl. xxviii., f. 5-8.

Shell larger than the preceding species; anterior valve covered with oval tubercles, not arranged in any distinctly radial lines; lateral areas of median valves clearly differentiated, sculptured with seven or more radiating rows of oval tubercles; central areas horizontally lined.

Posterior valve with mucro nearly terminal; ante-mucronal area horizontally lined; post-mucronal area tuberculate.

Girdle scales somewhat similar to those of *L. gaimardi*, but smaller, the conical type predominating.

Interior dark purple-brown, sutural laminae lighter. Slits: 10-11—1—0.

Dimensions: 55 x 35 mm.

Station: Similar to that of *L. gaimardi*, and also under stones in rock pools.

Habitat: Northern New South Wales, Queensland to Townsville.

Remarks: Very common on the ocean coast, even in the most exposed positions, where the valves are generally eroded; when found under stones in rock pools the sculpture is less affected, examples being occasionally found with the sculpture intact. In the latter station the girdle is distended to such an extent that the scales and spines are widely separated, showing the white surface of the integument to which they are attached. Upon removing the shell from the stones the girdle rapidly contracts, and the covering scales and spines become crowded together, as seen in all dried specimens.

Genus ACANTHOZOSTERA, n. gen. *

Type *Chiton gemmatus* Blainville.

Shells large, round-backed, depressed, oval, sculpture coarse, small nodules on anterior valve and lateral areas, pleural areas with irregular linear nodules; posterior valve with mucro prominent, elevated, terminal; girdle densely clothed with long, slightly curved or straight calcareous spines, alternately banded in black and white, insertion plates in all valves long and strongly denticulate, that of the posterior valve almost perpendicular; teeth coarse, deeply grooved exteriorly, irregularly spaced, 8-12 in anterior and posterior valves, invariably 1 on each side of the median valves. Differs from *Amphitomura* Pilsbry (*Nautilus* vi., 1893, 105. Type by original designation *Chiton borbonicus* Deshayes = *brevispinosus* Sowerby) in that the latter has the mucro depressed, and the insertion plate of the posterior valve reduced almost to a striated callus, with two well-pronounced lateral teeth.

ACANTHOZOSTERA GEMMATA.

Plate xxxvii., figs. 33, 34.

Chiton gemmatus Blainville, Diet. Sci. Nat. (Levrault), xxxvi., 1825, 544. New Holland. Type in Paris Mus. ?

Acanthopleura spiniger E. A. Smith, Zool. Coll. Alert, 1884, 81. Haddon, Zool. Challenger, xv., 1886, Polypl. 23. Not *Chiton spiniger* Sowerby, Mag. Nat. Hist. (Charlesworth), iv., 1840, 287, Suppl., pl. xvi., f. 2. Loc. unknown. Type lost.

* See *Amphitomura*, p. 170, ante.

Acanthopleura gemmata Iredale, P.Z.S., 1914, 668.

Acanthopleura gemmata queenslandica Ashby, Journ. Proc. Roy. Soc. West Aust., viii., 1923, 30. Dunk Island, Queensland. Type in coll. Ashby.

[*Chiton cunninghami* Reeve, Conch. Icon., iv., 1847, pl. xxvii., sp. & f. 181. Australia. Type in Brit. Mus. appears to be *Amphitomura brevispinosa* Sowerby, and not Australian].

Shell large, round-backed, depressed; colour brown or greenish-grey, with inverted V-shaped markings or straight dorsal line in black on valves ii. to viii., or wholly black.

Anterior valve minutely granulose throughout, studded with large tubercles, rarely rayed or forming concentric lines; small eyes notable.

Median valves minutely granulose throughout; pleural areas often showing no other sculpture, sometimes with tubercles also; lateral areas small, slightly raised, with irregular larger tubercles, sometimes rayed.

Posterior valve with mucro elevated, post-median; post-mucronal slope a little convex.

Girdle broad and fleshy, densely covered with long calcareous spines, slightly curved or straight, black, green or white, generally alternately banded.

Interior purplish-brown, sometimes showing a bluish sheen medially, and paler laterally. Slits 8-12—1—8-12.

Dimensions: 95 x 60 mm. (dried example), living examples may be found up to 120 x 80 mm.

Station: On the surface or in crevices of rocks or coral "nigger heads"; or under stones above median tide mark, frequently at or near high water mark.

Habitat: Tropical Australia (Torresian Region, including the whole coastline from Darwin east and south to Port Curtis, and west and south to Bunbury).

Remarks: The variation in this species is seen mostly in shape—broad or narrow—elevation, size, density and length of girdle spines. The very extensive series examined from the entire Torresian Region discloses no geographical difference between eastern and western examples, a great deal of the variation being due to the ecological environment. Erosion is general, as is usual with emergent species; it is worthy of remark, however, that fully adult specimens in perfect condition, without any trace of erosion, have been taken from under stones above median tide mark.

Genus ACANTHOPLEURA.

Acanthopleura Guilding, Zool. Journ., v., 1829, 27. Type by subsequent designation (Gray, P.Z.S., 1847, 168) *Chiton spinosus* Bruguiere.

Francisia Dall, Proc. U.S. Nat. Mus., 1881, 284, 289, 290; 1882, ex Cpr. M.S. Type by monotypy *Chiton spinosus* Bruguiere.

Shell large, round-backed, depressed, oval, sculpture finer than in *Acanthozostera*, girdle spines exceedingly long and curved. The long teeth of the insertion plate in the anterior valve, more than half the length of the tegmentum, and the slitting (more than one) of the median valves, characterise this group internally; the very long girdle spines distinguishing the genus superficially.

ACANTHOPLEURA SPINOSA.

Plate xxxviii., figs. 1, 2.

Chiton spinosus Bruguiere, Journ. d'Hist. Nat. (Paris), i., 1792, 25, pl. 2, f. 1, 2 A.B.C. Loc. unknown. Type lost. *Chiton spinosus* Burrows, Elem. of

Conch., 1815, 185, pl. xxvi., f. 4. Loc. unknown. Type lost.

Chiton spinosus Reeve, Conch. Icon., iv., 1847, pl. 9, f. 51.

Francisia spinosa Haddon, Zool. Challenger, xv., 1886, Polypl., 30.

Acanthopleura spinosa Pilsbry, Man. Conch., xiv., 1893, 220, pl. 45, f. 80-87.

Acanthopleura spinosa var. *montebelloensis* Ashby, Journ. Proc. Roy. Soc. West Aust., viii., 1923, 32. Monte Bello Island. Type in coll. Ashby.

Shell large, depressed, round-backed, oval. Colour wholly blue-black.

Anterior valve very finely radially ribbed with minute nodules, concentrically finely lined with minute growth lines.

Median valves with lateral areas scarcely raised, sculptured as in anterior valve; pleural areas smooth, valve crossed by minute growth lines.

Posterior valve with mucro elevated, at posterior fourth; post-mucronal area convex, sculptured as anterior valve. ante-mucronal area as pleural area, growth lines more marked.

Girdle broad, fleshy, covered with very long, curved, black spines.

Interior bluish-white, purple medially. Slits 15-16—1-3—8-10.

Dimensions: 77 x 46 mm.

Station: On the surface of rocks above median tide mark.

Habitat: North-western, North-eastern and Northern Australia. (Extra-limital, Java, Timor, New Guinea, Philippine Islands, New Caledonia).

Tropical Northern Australia.

Genus ONITHOCHITON.

Onithochiton Gray, P.Z.S., 1847, 65. Type by subsequent designation (id., p. 169) *Chiton undulatus* = *O. neglectus* Rochebrune.

Ornithochiton Cpr., in Dall, Proc. U.S. Nat. Mus., 1881, 284. (Emendation only).

Shell small to large, round-backed, oval, elevated; sculpture of nodules or fine linear longitudinal; girdle fleshy, very finely spiculose; posterior valve with callus only; insertion plates finely denticulate, as is the sinus; sutural laminae large; eight slits in anterior valve, one on each side of median valves.

ONITHOCHITON QUERCINUS.

Plate xxxviii., figs. 4-9.

Chiton quercinus Gould, Proc. Bost. Soc. Nat. Hist., ii., 1846, 142. New South Wales. Type in Philad. Acad. U.S. Expl. Exped. Moll., 312, f. 437.

Chiton incii Reeve, Conch. Icon., iv., 1847, pl. xvi., sp. 94, f. 96 = 94. Raines I., Torres Strait. Capt. Ince. Type in Mus. Cuming in Brit. Mus.

Onithochiton rugulosus Angas, P.Z.S., 1867, 115, pl. xiii., f. 29. Port Jackson, New South Wales. Type in Brit. Mus.

Onithochiton lyellii Pilsbry, Man. Conch., xiv., 1893, 247, pl. 55, f. 1-7.

Onithochiton quercinus id. ib., 248, pl. 55, f. 12, 13.

Onithochiton rugulosus id. ib., 249, pl. 55, f. 19.

Onithochiton scholviemi Thiele, Revision Chitonen (Chun's Zoologica, Heft 56), ii., 1910 = Dec., 1909, 99, pl. x., f. 60, 61. New South Wales. Type in Berlin Museum. Ashby, Trans. Roy. Soc. S. Aust., xlvii., 1923, 230, pl. xviii., f. 1.

Shell large, elongate oval, round-backed, weakly sculptured. Colour extremely variable and brilliant, consisting generally of wavy vertical splashes of red, brown or green on a creamy or buff ground, with darker smaller splashes on the jugum; sometimes entirely black, deep red, rose, or green; occasionally with one or more valves in black and the others having the vertical coloured wavy splashes.

Anterior valve with nine radial rows of eyes separated by series of crescentic sulci giving an appearance of imbricating flattened, broad scales (*quercinus*), sometimes with the rows of eyes indistinct, otherwise smooth save for growth

lines (*scholvi*); juvenile with bolder nodule-like markings, apical portion smooth (*rugulosus*).

Median valves with lateral areas little raised, a semi-nodulose diagonal rib, crossed by longitudinal wavy close-set riblets which pass across the pleural areas, becoming weak on the jugum (*quercinus*); otherwise with lateral areas scarcely raised, smooth save for growth lines, pleural area with a few slight longitudinal cuts vanishing on the jugum (*scholvi*); juvenile with well marked nodulose rib separating the lateral from the pleural area, and another nodulose rib touching the lateral; pleural area well ridged (*rugulosus*).

Posterior valve with mucro depressed, terminal; sculpture agreeing with that of preceding valves.

Girdle very broad, fleshy, very finely spiculose.

Interior pinkish-white with central purple blotch. Slits 8-1-0, callus well formed.

Dimensions: 60 x 32 mm.

Station: On the upper side or at the edge of insertion of stones in deep pools, below low water mark; or on the surface or in crevices of rocks above median tide mark. In the former station nearly all examples are in perfect condition, the girdle is soft and spongy, and delicately veined in red. In the latter station the examples are almost invariably very old, eroded or overgrown with *Lithothamnium*, and the girdle is leathery, banded black and yellow.

Habitat: New South Wales; Queensland as far north as Mackay (? Raine I.); Western Australia from Esperance to Abrolhos Is.

Remarks: Thiele described as from New South Wales a new species, *O. scholvi*, and Iredale recognised in this species the Western Australian shell, suggesting that Thiele's locality was erroneous, but he now finds that Thiele's form is common in New South Wales, and may represent a sexual difference, in any case it cannot be regarded as specific. Other species of *Onithochiton* show somewhat similar variation, and the two extremes always attract attention, so that we have figured both forms.

The Western Australian shells all seem to be of the *scholvi* type, while some are altogether smooth.

ONITHOCHITON ASHBYI.

Plate xxxviii., fig. 3.

Onithochiton ashbyi Bednall & Matthews, Proc. Mal. Soc., vii., 1906, 92, pl. ix., f. 2, 2c. South Australia. Type in coll. Bednall, now Matthews.

Shell small, elongate oval, elevated, not carinated, side slopes curved; sculpture of coarse nodules on anterior valve and lateral areas, pleural areas smooth; girdle horny (probably fleshy when alive). Colour rich cream, splashed along the jugal area with bright orange-brown, a few blotches of the same colour at the sides of some valves.

Anterior valve with scattered nodules irregularly and interruptedly rayed; eight rays may be distinguished.

Median valves with lateral areas small but strongly elevated, with two irregular rows of elongated elevated nodules; pleural areas smooth, very finely transversely striate.

Posterior valve with mucro terminal, a little upturned, post-mucronal area present only as an upturned edge with three nodulose ridges present; ante-mucronal area a little concave, smooth.

Girdle horny (in dried type shell).

Interior white. Slits 8-1-0; posterior callus sinuate medially.

Dimensions: 8.5 x 4.5 mm. (curled type).

Station: 9.

Habitat: South Australia.

Remarks: The original figure is poor, as noted by the authors. Our figure and description are from the type. At present only two specimens are known.

Genus LUCILINA.

Lucilina Dall, Proc. U.S. Nat. Mus., 1881, 290. New name for *Lucia*. Type by monotypy *Chiton confossus* Gould.

Lucia Gould, Proc. Bost. Soc. Nat. Hist., viii., 1862, 283. Type by original designation *Chiton confossus* Gould. Feejees.

Toniciopsis Thiele, Das Gebiss der Schnecken (Troschel), ii., 1892, 371. Type by subsequent designation (Thiele, 1909), *Chiton pictus* Reeve.

Shell small to medium, elevated, round-backed or carinated, elongate oval, posterior valve with prominent elevated mucro, sculpture of pits and nodules, girdle fleshy, finely spiculose; insertion plates finely pectinated, as is sinus; slits 8-12, the posterior insertion plate with a forward tendency. Two well-defined sections are found in Australian waters, the one large, weakly sculptured, round-backed; the other smaller, strongly sculptured, carinated; a third, like the latter but more finely sculptured, occurs throughout the Pacific.

LUCILINA FORTILIRATA.

Plate xxxviii., fig. 11.

Chiton fortiliratus Reeve, Conch. Icon., iv., 1847, pl. xviii., sp. & f. 112. Raine's

I. Torres Strait. Type in Mus. Cuming in Brit. Mus. Smith, Zool. Coll.

Alert, 1884, 84. Port Darwin.

Tonicia fortilirata Pilsbry, Man. Conch., xiv., 1893, 207, pl. 40, f. 3, 4.

Shell medium, elongate oval, semi-carinated, sculpture very bold, especially on pleural areas; girdle fleshy. Colour yellowish, variegated with green, stained with red in the middle (type). In a series from Darnley Island, Torres Strait, considerable variation is seen, some being wholly red, others greyish splashed with green only, and one with black markings on valves ii., iii., and viii.

Anterior valve with curved separate nodules, apices backward, rayed in a dozen irregular rays, apex smooth.

Median valves with lateral areas raised with two obsoletely nodulose radials bounding the area, about ten nodules to a row, enclosing three or more irregular rows of smaller nodules; pleural areas with about ten broad square-cut ridges with narrow interstices on each side, leaving a very narrow smooth jugal line.

Posterior valve with mucro elevated, post-median; post-mucronal slope convex, ante-mucronal area concave, sculptured as pleural areas; post-mucronal area rayed with fine nodules, about twenty rather irregular rows being counted.

Girdle fleshy, becoming horny in dried examples, densely covered with minute spicules.

Interior pinkish-white. Slits 8-13.

Dimensions: 28 x 18 mm. (type), 16.5 x 8 mm. (specimen figured and described).

Station: Under stones in coral sand below low water mark; dredged in 8-10 fathoms in sand and mud (Coppinger).

Habitat: Raine's Island, Torres Strait (Ince, type), Port Darwin (Coppinger), Darnley Island (E. H. Matthews).

LUCILINA RAINFORDIANA.

Plate xxxviii., fig. 10.

Lucilina rainfordiana Hull, Proc. Roy. Soc. Queensland, xxxvi., 1924, 115, pl. xxi., f. 3. Port Denison, North Queensland. Type in Queensland Museum.

Shell small to medium, elevated, carinated, side slopes very slightly convex. Colour very variable, brilliant when alive, in most instances fading to dull brown, red or green when dry.

Anterior valve with eleven radiating grooves, the interspaces filled by 4-5 imbricating pustules with the apices directed backward. Ocelli visible all over the valve.

Median valves with lateral areas strongly differentiated, covered with three radiating rows of large flattened imbricating pustules, the central row smaller than the two outer ones; central areas having 10-12 high curved riblets, the bases corresponding with the anterior row of pustules on the lateral areas, and curving inwards to the jugum; ocelli visible on all the valves, mostly scattered along the grooves in the lateral areas.

Posterior valve with mucro very prominent, posterior, nearly straight behind; ante-mucronal area similar to central areas of median valves, with ocelli visible between the riblets; post-mucronal area densely covered with small rounded pustules.

Girdle wide, fleshy, densely covered with minute short chaffy spicules.

Interior bluish-white. Slits 8-1-12-13.

Dimensions: 15 x 7.5 mm. (type), 24 x 15 (maximum measured).

Station: On the under side of stones and dead coral in coral sand below low water mark.

Habitat: Queensland, from Port Denison to the Capricorn Islands.

Remarks: This is the southern form of *L. fortirata*, the principal difference being in its bolder sculpture throughout, but especially marked on the lateral areas.

LUCILINA SHIRLEYI.

Plate xxxviii., figs. 12, 14.

Lucilina shirleyi Iredale, Proc. Mal. Soc., xi., 1914, 131, new name for *Chiton pictus* Reeve. Type in Brit. Mus.

Chiton pictus Reeve, Conch. Icon., iv., 1847, pl. xv., sp. & f. 79. Raines Island, Torres Strait. Type in Mus. Cuming in Brit. Mus. Not *Chiton pictus* Blainville, Dict. Sci. Nat. (Levrault), xxxvi., 1825, 541.

Tonicia confossa Gould, Melvill & Standen, Journ. Linn. Soc. (Lond.), xxvii., 1891, 180.

Tonicia picta Pilsbry, Man. Conch., xiv., 1893, 211, pl. 40, f. 5, 6.

Shell medium, elongate oval, elevated, round-backed. Colour variable; pinkish-white, showily painted with green and scarlet spots (Reeve); in a very large series, collected by Hull and Rainford along the Queensland coast from Whitsunday Passage to Howick Islands numerous colour varieties occur, some being wholly dark-red, others reddish, splashed with green, others with one or more valves in black. The colouring is very brilliant in living examples, but is not so liable to fade when dry as in the two preceding species.

Anterior valve with rays of inverted V-shaped nodules, subimbricating, showing eyes between.

Median valves with laterals little raised, bounded by two indistinct ribs more or less elongately tile marked, intervening area depressed, faintly nodulose, rows of eyes behind the anterior rib; pleural areas marked with continuation upward of the longitudinal ribs which tend to turn and cross towards the jugum; the jugal area broad, wedge-shaped, smooth but pitted irregularly with jagged dashes.

Posterior valve large, mucro elevated at about posterior fourth; post-mucronal slope slightly convex; ante-mucronal area as pleural areas; post-mucronal area faintly nodulose, often almost smooth.

Girdle wide, fleshy, densely covered with minute chaffy spicules.

Interior white. Slits 8-1-12.

Dimensions: 30 x 15 mm., dried example from Darnley Island figured.

Station: On the under side of stones or blocks of dead coral embedded in mud or coral sand, generally above median tide mark, but also found in deeper water.

Habitat: Queensland, from Torres Strait to Capricorn Group.

Remarks: The group to which this species belongs shows so little variation that subspecific rank is probably all the named members are entitled to. As the western (Sharks Bay) series is separable we allow the species until a review with series from each locality is undertaken. The earliest described species is *Chiton lamellosus* Quoy & Gaimard (Voy. Astrol. Zool., iii., 1835, 386, pl. 74, f. 29-32) from Tonga Tabu, then comes *Chiton confossus* Gould (Proc. Bost. Soc. Nat. Hist., ii., 1846, 143) from Fiji.

LUCILINA DILECTA.

Plate xxxviii., fig. 15.

Lucilina dilecta Thiele, Die Fauna Sudwest. Aust., iii., Dec., 1911, 397. Shark's Bay, Western Australia. Type in Berlin Museum. Ashby, Trans. Roy. Soc. S. Aust., xlv., 1921, 47, pl. viii., f. 2 a-c.

Tonicia truncata Odbner, Kungl. Svenska Vetensk. Handl. Bd., 52, No. 16, 1917, 12.

Tonicia (*Lucilina*) *dilecta* Ashby, id. ib., xlvii., 1923, 230, pl. xviii., f. 2.

Shell large, like the preceding species, but with stronger sculpture.

Anterior valve more clearly sculptured with smaller wedge-shaped nodules.

Median valves with lateral areas more regularly finely nodulose between the ribs; pleural areas more strongly sculptured with irregular ribs slanting towards the jugum, which is pitted; in some instances fine straight longitudinal ribs develop in the pleural areas, and a very distinct looking shell is seen. That this is only a variant is proved by the fact that some shells show both kinds of sculpture.

Posterior valve with mucro more posterior and less elevated; radials on post-mucronal area more pronounced.

Girdle and interior characters as in the preceding species.

Dimensions: 46 x 25 mm.

Station: Mr. Tom Carter collected a number of specimens which had been scraped off pearl oysters at Shark's Bay, Western Australia.

Habitat: Western Australia.

LUCILINA HULLIANA.

Plate xxxviii., fig. 13.

Tonicia hullianus Torr, Trans. Roy. Soc. S. Aust., xxxv., Dec., 1911, 104, pl. xxv., f. 4 a-f. Ellenbrook, South Western Australia. Type in coll. Torr.

Shell medium, broad, elliptical, round-backed, side slopes curved. Colour reddish-buff, mottled on dorsal areas, turning to deep red on some of the lateral areas, a few minute irregular black and white spots.

Anterior valve with about 15 or more fine striae radiating from the apex, with a slightly raised rib between each pair, each rib bearing ocelli.

Median valves: the second is larger than the succeeding five; lateral areas with three to five almost obsolete flattened ribs, with ocelli in the interstices.

pleural areas almost smooth, crossed by growth lines, and having a few rudimentary pits; jugum smooth, flecked anteriorly with triangular white markings.

Posterior valve with mucro prominent, terminal; post-mucronal slope perpendicular; ante-mucronal area as pleural areas; post-mucronal area finely irregularly rayed, the rays crossed by growth lines.

Girdle fleshy, covered with minute chaffy spicules.

Interior pearly white. Slits 8-1-12.

Dimensions: 30 x 20 mm.

Station: Under a stone in a rock pool.

Habitat: Ellenbrook, south of Cape Naturaliste, Western Australia.

Remarks: Dr. Torr kindly lent us his type shell for examination and figuring. The species appears to be a remarkably smooth form of *L. dilecta* Thiele. As both species were described simultaneously, the descriptions appearing in December, 1911, priority must be given to Torr's name should examination of a series show that both forms are found in the southern locality, as Torr's shell was figured, while Thiele's was not.

LUCILINA CARPENTERI.

Tonicia carpenteri Angas, P.Z.S., 1867, 116, pl. 13, f. 30. Port Jackson, Australia. Type in Brit. Mus. Pilsbry, Man. Conch., xiv., 1893, 208, pl. 40, f. 7.

"Shell ovate, elevately convex, carinated, ashy white, ornamented at the hinder edges of the valves with pale spots, the spaces between which are very dark olive, melting into confused bands of a paler hue which extend nearly across the valves; valves rostrate, undulately concentrically subimbricately sculptured throughout; the lateral areas not raised but separated from the dorsal areas by an elevated rib. Posterior valve strongly gibbous, the umbo almost terminal; mantle margin brown. Length 9 lines. (Angas).

Pilsbry publishes Carpenter's descriptive notes, as follows:—"One specimen without anterior valve. The specimen as it stands measures length 17, breadth 15 mill.; but measuring the valves only and allowing for the missing anterior valve it would be length 16, breadth 10 mill. Shell oval, moderately elevated, the dorsal ridge acute; olive clouded with dark, tessellated with light so as to appear toothed at the sutures. Mucro central, swelling, elevated, the posterior slope convex. Jugal area a rather narrow, nearly smooth dorsal line. Central areas with about 16 finely, rugosely sculptured, nearly concentric, but faint, grooves on the otherwise smooth surface. Lateral areas slightly raised by the curved diagonal; having lines of stumpy granules and concentrically rugosely grooved in continuation of the sculpture of the central areas, obsolete at sutures. Posterior valve concentrically grooved like the rest, all around. Girdle nearly smooth, very slightly lanugate. Posterior valve with 11 slits; teeth rather sharp, grooved outside. eaves very small. Sinus broad, flat, deep, having about 17 very slight teeth.

This species is a transition toward *Acanthopleura* in the thrown-forward teeth, but girdle and sinus are more Tonicoid."

We record this species with reservations. Many years of intensive collecting in Port Jackson have failed to disclose another example, and the genus is not known to occur on the eastern coast of Australia south of the Capricorn group. From its description and figure it suggests a weakly sculptured *L. fortirata*. Iredale, from examination of the type, was unable to locate it, and is of opinion that it did not come from Port Jackson.

Genus SCHIZOCHITON.

Schizochiton Gray, P.Z.S., 1847, 65, 68. Type by monotypy *Chiton incisus* Sowerby.

Shell large, elongate, narrow, elevated, carinated, posterior valve deeply fissured, girdle spiculose, posteriorly slit; anterior insertion plate six-slit, corresponding with the external rows of ocelli, which, however, sometimes number 7 or 8, the additional rows developing at the edges; teeth denticulate; median valves with one or two slits on each side; sinus obsolete, finely denticulate. The genus is recognisable at sight by the fissured posterior valve, and the great development of the ocelli is a very remarkable feature.

SCHIZOCHITON POLYOPS, n.sp.

Plate xxxviii., figs. 16, 17, 19-21.

Chiton elongatus Reeve, Conch. Icon., iv., 1847, pl. viii., sp. & f. 40, a, b. Raines Island, Torres Strait. Capt. Ince. Type in Mus. Cuming in Brit. Mus. Not *Chiton elongatus* Blainville, Dict. Sci. Nat. (Levrault), xxxvi., 1825, 542.

Schizochiton elongatus Brazier, Proc. Linn. Soc. N.S.W., ii., 1877, 75. North Queensland.

Schizochiton incisus E. A. Smith, Zool. Coll. Alert, 1884, 82. North Queensland. Not *Chiton incisus* Sowerby, P.Z.S., 1841, 61. I. Zebu, Philippine Islands. Haddon, Zool. Rep. Challenger, xvi., 1886, Polypl., 31. Melvill & Standen, Journ. Linn. Soc. (Lond.), Zool., xxvii., 1891, 181.

Shell large, elongate, narrow, elevated, carinated. Colour greyish-white, flamed with brown, principally on the jugum, but sometimes so densely covered with colour markings that the whitish ground colour is almost entirely obscured.

Anterior valve with six notable rays of ocelli, between which are wavy or zig-zag grooves, with ridges between being narrow, square-cut, of about the same width.

Median valves with lateral areas small, very slightly raised, but a prominent ray of ocelli on the diagonal, the area being sculptured concentrically with grooves and ridges similar to those on the anterior valve; these pass over and cross the pleural areas in all the valves except the second, on which they only cross at the edges and less than half way, otherwise leaving a large wedge-shaped jugal area, smooth, with longitudinal pitting; in the other valves the jugal area is a very narrow smooth band.

Posterior valve as long as valve vii., with mucro elevated, terminal, deeply fissured on the post-mucronal area, which bears three rays on each side of the fissure similar to those on the anterior valve and similarly sculptured between; ante-mucronal area as pleural areas.

Girdle very broad, fleshy, densely finely spiculose, with bunches of larger spicules at the sutures.

Interior white, sometimes pinkish or greenish, with a large purple blotch medially. Slits 6-7—1-2—5-6. Sinus crenulated.

Dimensions: 50 x 22 mm.

Station: In crevices or on the under side of loose blocks of dead coral; sometimes under stones embedded in mud or coral sand at or above low water mark.

Habitat: North Queensland, from Cooktown to Torres Strait.

Remarks: This species differs from *S. incisus* Sowerby from the Philippine Islands in the more numerous grooves and ridges on the lateral and central areas, and in the greater number of ocelli, the latter feature suggesting the name proposed. The jugum is also smooth or nearly so, while that of the northern species is striated.

APPENDIX A.

TERATOLOGY.

Malformations, or deviations from the normal type of structure, in the form of shells possessing less than eight valves, are referred to in the first section of this Monograph under the heading "Teratology." Linnaeus (Syst. Nat., ed. x., 1758, 667) listed four species of the genus *Chiton*; *C. hispidus*, which he described as 6-valved, *C. tuberculatus*, 7-valved, and two other species 8-valved, indicating that he regarded the normal number of valves as varying from six to eight. Schumacher, the author of the ordinal name LORICATA, defined the group as consisting of shells with six or eight valves. Fleming (Hist. Brit. Anim., 1828, 289) describing *Chiton marginatus* Pennant (= *Ischnochiton cinereus* Linn.) stated "I possess a variety of this shell, which I found under a stone at Newhaven in 1811, with only six valves." He also refers to the *C. crinitus* of Pennant, which the latter described as "with seven valves."

Pilsbry, in the introduction to his Manual, said: "It is likely that the six-valved were artificial fabrications, although a certain number may perhaps be traced to incorrect drawings. Most seven-valved specimens are due to the soldering together of two valves in consequence of some injury. This is not uncommon, a number of cases having come under my observation. Individuals actually seven-valved are known to occur, although they are far from common. The writer has examined many thousand Chitons, but has only seen two normally 7-valved examples. One of these is figured . . . and as may be seen, it is in no respect abnormal save in the want of one central valve, and the consequent lengthening of the others. There is absolutely no trace of the missing valve. The absence of a valve produces no striking change in the general appearance of the animal, and it would be easy to pass one by among a quantity. These considerations incline me to think that abnormalities in the valves may be less rare than supposed."

Henn (P.L.S., N.S.W., ser. 2, ix., 1894, 178) in describing the contents of a bottle found in a rock pool at low water, Watson's Bay, Sydney, recorded "*Cryptoplax striatus* Lam. One specimen, three valves." Nierstrasz and Pelseneer both misread this as meaning a specimen having three valves only, whereas it was a normal specimen and three separate valves. Oliver has quoted Pelseneer, without questioning the accuracy of the record.

Bednall (Proc. Mal. Soc., ii., 1897, 154) under the heading of *Plaxiphora conspersa* Ad. & Ang. (= *Kopionella matthewsi* Iredale) quotes Pilsbry in part, and adds "Mr. Matthews is in possession of a veritable six-valved specimen of *P. conspersa*." This shell is still in the Matthews collection, and another similar 6-valved specimen, collected by Matthews, was included in a series of six examples of that species presented to the British Museum by Bednall, but it remained unnoticed until Iredale detected it in 1910.

Iredale (Trans. N.Z. Inst., xi., 1907, 375) recorded the occurrence of a 5-valved specimen of *Chiton pelliserpentis* Q. & G., and a 6-valved *Plaxiphora ovata* Hutton, from New Zealand. The same author (Proc. Mal. Soc., ix., 1910, 156) recorded *Sclerochiton curtisianus* Smith (= *Squamopleura curtisiana*) with seven valves, collected by him at Port Curtis, Queensland; two 7-valved *Ischnochitons* from the Kermadec Islands (= *I. kermadecensis* Iredale), and a 7-valved *Craspedochiton cinereus* Linn., collected by him at Seascale, Cumberland, England.

May and Torr ("The Polyplacophora of Tasmania," Pap. & Proc. Roy. Soc. Tas., 1912, 29) under *Ischnochiton crispus* Reeve (= *I. elongatus elongatus* Blainville), place on record that "A very unusual five-valved specimen was found by W. G. Torr at Ulverstone (Tasmania) in July, 1908,"

Oliver ("Variation in Amphineura," Trans. N.Z. Inst., lili., 1921, 361) quotes previous records of abnormal extra-limital Loricates, and (in addition to those already mentioned in this Appendix) *Onithochiton neglectus*, with seven valves, from New Zealand, and describes a specimen of *Callochiton (Levicoplax) platessa* Gould, having seven valves on the left side only.

S. Stillman Berry (Ann. & Mag. Nat. Hist., ser. 9, xvi., July, 1925, 174) described an abnormal specimen of *Acanthopleura granulata* Gmelin from Key Vacca, Florida, which he considered sufficiently unusual to be made of record. "The malformation consists not only in the reduction of the number of valves from eight to seven—an abnormality amply rare enough in itself to have induced comment practically wherever noted,—but in the evident manner in which this has come to pass and the striking deformity which has resulted." In this specimen the abnormality was caused by the fusion of valves i. and ii., resulting in a greatly elevated and beaked valve of twice the normal length. Berry refers, in the same paper, to Crozier's record (Amer. Nat., 53, 1919, 278) of two specimens of *Chiton tuberculatus* Linn., collected at Bermuda, in which the last two plates were similarly coalesced.

The example having three valves only, referred to in our introductory section, as being in the British Museum, belongs to the species *Ischnochiton contractus* Reeve (= *I. lineolatus* Blainville), and was collected in Victoria by Mrs. Kenyon, and recorded by Sykes (Journ. Malac., vii., 1900, 164, text-fig. 1).

The foregoing records of abnormal examples are quoted chiefly to show how rare such aberrants were considered by the authors cited. The comparatively large number of examples recorded by us is due, not only to a very keen examination of all specimens passing through our hands, but to the extremely rich field provided by the Australian littoral. It is no exaggeration to say that a collector could easily take 1,000 Loricates, comprising at least twenty species, during one period of low water in Sydney Harbour, or any other fairly sheltered spot in the sandstone region.

In May, 1925, Hull (P.L.S., N.S.W., 1, 1925, xxxix.) exhibited at a meeting of the Linnean Society of New South Wales 40 examples of abnormal Loricates, having less than eight valves. Twenty species were represented, and there were specimens having five, six, or seven valves. In September, 1925, he exhibited specimens of two species of Loricates having nine valves each (*loc. cit.*, xliii.).

In examining some 30-40,000 Australian Loricates we have seen 78 specimens of 31 species having seven valves, and showing in only a few instances a trace of injury or fusion of two valves. There is no "consequent lengthening of the others," such as Pilsbry describes in the case of his specimen. They are nearly all obviously congenital abnormalities, and the loss of one valve has not had any apparently injurious effect on the animals. In fact, many are particularly fine, healthy examples. We have also found 17 examples of nine species having six valves, but have not so far found one with five; Torr's *I. crispus* is the only 5-valved example of an Australian species known to us. In addition to the apparently congenital examples we have found numerous specimens in which injury has resulted in (a) the fusion of two valves, which form one of abnormal proportions (Plate xxxix., figs. 2 and 16), (b) the loss of one side of a median valve, and the complete closure of the resulting gap, with a consequent shortening of the injured side and curvature of the dorsum (Plate xxxix., fig. 18), and (c) the fracture of one or more valves dorsally, with a curious recurved prolongation of the fractured edges resulting from a determined effort on the part of the animal to effect repair of the damage. The lastnamed abnormality is illustrated by figures 17 and 18 of plate xxxix., and doubtless is the result of

the complete fracture of the organic frame upon which the calcareous deposit forming the shell is lodged.*

The discovery by Hull in 1925 of two perfect examples having nine valves was a striking proof of Pilsbry's suggestion as regards seven-valved examples that "it would be easy to pass one by among a quantity." The specimens had been in his possession, one for four, and the other for two years, and it was only when he was carefully examining his whole collection for abnormalities that these remarkable departures from the normal were noticed. They are both figured on plate xxxix. (figs. 14 and 15), and present no trace whatever of fission or any injury which might result in the formation of an additional valve. Each of the seven median valves is perfectly and symmetrically graduated, as in the case of a normal specimen having six median valves. In each case valve ii. is longer, narrower, and more elevated than the remainder; valves iv., v., and vi. are practically of the same dimensions, while valve vii., and the adventitious one show a gradual reduction in width to meet the narrow tail valve. Recently Mr. E. M. Matthews returned from Darnley Island, Torres Strait, the proud possessor of a third nine-valved example, with the extraordinary report that some local residents had informed him that such extravagant shells were "quite common."

In appending a list of species of the abnormal Australian Loricates recorded, and that we have seen, or know are possessed by several Australian collectors, we would hazard the estimate that about 2 per 1,000 of the specimens examined by us exhibit congenital departures from the normal eight valves. The figure placed after the name of the collector indicates the number of examples of each particular variety possessed by such collector.

* By immersing a Loricata in a 25 per cent. solution of muriatic acid the calcareous deposit will be discharged, and the gelatinous frame, with all its details of sculpture, will remain.

LIST OF ABNORMAL AUSTRALIAN LORICATES.

(Those marked * have been previously recorded.)

- Ischnochiton elongatus elongatus*, 5-valved, Torr 1*; 7-valved, Hull 5.
Ischnochiton elongatus crispus, 6-valved, Hull 3, McAndrew 1; 7-valved, Hull 7, McAndrew 2.
Ischnochiton examinandus examinandus, 7-valved, Hull 1
Ischnochiton lineolatus, 3-valved, Brit. Mus. 1 (*I. contractus* *).
Ischnochiton versicolor versicolor, 7-valved, Hull 7, McAndrew 2.
Ischnochiton examinandus examinandus, 7-valved, Hull 1.
Heterozona cariosa, 7-valved, Hull 1.
Heterozona subviridis, 7-valved, Hull 1.
Ischnoradsia australis australis, 6-valved, Hull 1; 7-valved, Hull 1, McAndrew 3.
Ischnoradsia evanida novae-hollandiae, 7-valved, Hull 1.
Haploplax smaragdina, 6-valved, Hull 1, McAndrew 4; 7-valved, Hull 1, McAndrew 3.
Haploplax lentiginosa, 6-valved, Hull 1.
Haploplax arbutum, 7-valved, Hull 1.
Icoplax mayi, 7-valved, Aust. Mus. 1.
Levicoplax platessa, 6-valved, Brit. Mus. 1; 7-valved, Hull 3, Ashby 1.
Eudoxoplax inornata, 7-valved, Hull 1, Torr 2.
Lorica volvox, 7-valved, Hull 1; $7\frac{1}{2}$ -valved, Hull 1.
Loricella angasi, 7-valved, McAndrew 1, Hull 1.
Kopionella matthewsi, 6-valved, Matthews 1*, Brit. Mus. 1*.

- Acanthochiton granostriatus*, 7-valved, Hull 1.
Meturoplox retrojecta, 7-valved, Hull 1.
Notoplox gabrieli, 6-valved, Hull 1.
Craspedoplox variabilis, 7-valved, Hull 2.
Craspedoplox elegans, 7-valved, Hull 1.
Cryptoplox iredalei, 7-valved, Hull 1.
Poneroplox paeteliana, 7-valved, Hull 1.
Delicatoplox translucens, 7-valved, Hull 1.
Rhyssoplox coxi, 7-valved, Hull 2.
Rhyssoplox jugosa, 7-valved, Hull 7, McAndrew 5; 7½-valved, Hull 2.
Rhyssoplox tricostalis, 7-valved, Hull 1, Matthews 1.
Mucrosquama carnosus, 7-valved, Hull 1.
Sypharochiton septentriones, 6-valved, Hull 1; 7-valved, McAndrew 1.
Squamopleura curtisiana, 7-valved, Hull 1.
Liolophura gaimardi, 7-valved, Hull 1.
Clavarizona hirtosa, 7½-valved, Hull 1.
Acanthozostera gemmata, 6-valved, Aust. Mus. 1; 9-valved, Hull 1*, Matthews 1.
Onithochiton quercinus, 7-valved, Hull 1, McAndrew 1; 9-valved, Hull 1*.
 Recapitulation:—3-valved, 1 example; 5-valved, 1 example; 6-valved, 17 examples of 9 species; 7-valved, 78 examples of 31 species; 7½-valved, 4 examples of 3 species; 9-valved, 3 examples of 2 species. Total aberrants, 102 examples of 37 species.

EXPLANATION OF PLATES.

Plate xxxvii.

- Fig. 1. *Amaurochiton glaucus* Gray, whole shell.
 2. *Sypharochiton septentriones* Ashby, whole shell.
 3. *Sypharochiton maugeanus* Iredale & May, half median valve, smooth var.
 4. *Sypharochiton septentriones* Ashby, posterior valve, side view.
 5. *Squamopleura curtisiana* Smith, whole shell.
 6. *Sypharochiton mayi* Pilsbry, posterior valve, inside view.
 7. *Sypharochiton mayi* Pilsbry, posterior valve, side view.
 8. *Sypharochiton mayi* Pilsbry, whole shell.
 9. *Clavarizona hirtosa* Blainville, anterior valve.
 10. *Clavarizona hirtosa* Blainville, half median valve.
 11. *Clavarizona hirtosa* Blainville, posterior valve.
 12. *Clavarizona hirtosa* Blainville, girdle scales.
 13. *Liolophura gaimardi* Blainville, anterior valve.
 14. *Liolophura gaimardi* Blainville, half median valve.
 15. *Liolophura gaimardi* Blainville, posterior valve.
 16. *Liolophura gaimardi* Blainville, girdle covering.
 17. *Clavarizona hirtosa* Blainville, posterior valve, inside view.
 18. *Squamopleura carteri* Iredale & Hull, girdle scales.
 19. *Liolophura gaimardi* Blainville, posterior valve, inside view.
 20. *Squamopleura carteri* Iredale & Hull, whole shell.
 21. *Clavarizona hirtosa* Blainville, whole shell.
 22. *Amaurochiton glaucus* Gray, girdle scales.
 23. *Liolophura queenslandica* Pilsbry, anterior valve.
 24. *Liolophura queenslandica* Pilsbry, half median valve.
 25. *Liolophura queenslandica* Pilsbry, posterior valve.
 26. *Squamopleura curtisiana* Smith, posterior valve, inside view.
 27. *Squamopleura curtisiana* Smith, girdle scales.
 28. *Squamopleura carteri* Iredale & Hull, posterior valve, inside view.
 29. *Sypharochiton septentriones* Ashby, girdle scales.

30. *Liolophura queenslandica* Pilsbry, girdle covering.
31. *Liolophura gaimardi* Blainville, whole shell.
32. *Liolophura queenslandica* Pilsbry, whole shell.
33. *Acanthozostera gemmata* Blainville, posterior valve, inside view.
34. *Acanthozostera gemmata* Blainville, whole shell.

Plate xxxviii.

- Fig. 1. *Acanthopleura spinosa* Bruguiere, whole shell.
2. *Acanthopleura spinosa* Bruguiere, posterior valve, side view.
 3. *Onithochiton ashbyi* Bednall & Matthews, whole shell.
 4. *Onithochiton quercinus* Gould, whole shell.
 5. *Onithochiton quercinus* Gould, whole shell, smooth form from Western Australia.
 6. *Onithochiton quercinus* Gould, anterior valve.
 7. *Onithochiton quercinus* Gould, half median valve.
 8. *Onithochiton quercinus* Gould, posterior valve.
 9. *Onithochiton quercinus* Gould, girdle covering.
 10. *Lucilina rainfordiana* Hull, whole shell.
 11. *Lucilina fortilirata* Reeve, whole shell.
 12. *Lucilina shirleyi* Iredale, posterior valve, side view.
 13. *Lucilina hulliana* Torr, whole shell.
 14. *Lucilina shirleyi* Iredale, whole shell.
 15. *Lucilina dilecta* Thiele, whole shell.
 16. *Schizochiton polyops* Iredale & Hull, whole shell.
 17. *Schizochiton polyops* Iredale & Hull, half median valve.
 18. *Schizochiton incisus* Sowerby, half median valve.
 19. *Schizochiton polyops* Iredale & Hull, posterior valve from behind.
 20. *Schizochiton polyops* Iredale & Hull, posterior valve from above.
 21. *Schizochiton polyops* Iredale & Hull, posterior valve from side.

Plate xxxix.

- Fig. 1. *Sypharochiton pelliserpentis* Quoy & Gaimard, having five valves, resulting from fusion of ii. and iii., and vi. and vii.; valve iv. or v. wholly absent. (New Zealand).
2. *Ischnochiton elongatus crispus* Reeve, having six valves; valves iv. and v. fused, valve vii. wholly absent.
 3. *Ischnochiton versicolor versicolor* Sowerby, 7-valved.
 4. *Ischnoradsia evanida novae-hollandiae* Reeve, 7-valved.
 5. *Haploplax smaragdina* Angas, 7-valved.
 6. *Levicoplax platessa* Gould, 7-valved.
 7. *Lorica volvox* Reeve, 7-valved.
 8. *Rhyssoplax cori* Pilsbry, 7-valved.
 9. *Rhyssoplax jugosa* Gould, 7-valved.
 10. *Rhyssoplax tricostralis* Pilsbry, 7-valved.
 11. *Liolophura gaimardi* Blainville, 7-valved.
 12. *Squamopleura curtisiana* Smith, 7-valved.
 13. *Poneroplax pacteliana* Thiele, 7-valved.
 14. *Onithochiton quercinus* Gould, 9-valved.
 15. *Acanthozostera gemmata* Blainville, 9-valved.
 16. *Eudoxoplax inornata* Tenison-Woods, having valves vi. and vii. fused.
 17. *Liolophura queenslandica* Pilsbry, showing fracture and attempted repair of valve iii.
 18. *Rhyssoplax jugosa* Gould, showing fracture of valve iv., attempted repair of the left-hand half, and complete loss of right-hand half; with closure of consequent gap, and resultant curvature of dorsum.



From a sketch by Tom Ferry.

THE LATE ALLAN McCULLOCH.

Plate xl.

By the death of Allan Riverstone McCulloch at Honolulu in August, 1925, Australia has lost one of her foremost systematic zoologists, whose reputation as an ichthyologist was world-wide.

McCulloch was a man of retiring disposition, but with a really genial nature underlying his reticence. He had a boundless enthusiasm for his work, and no amount of ill-health could moderate either his enthusiasm or his industry. Entering the service of The Australian Museum at an early age, he was at first interested in the decapod crustacea, but soon turned to what was to become his life's work, the ordering of the Australian fish fauna. He described many new species, but the unravelling of old tangles lay nearer to his heart, and the clearing up of a difficult piece of synonymy always gave him acute pleasure. He set himself certain limits in his ichthyological work, and those limits may, to some, appear narrow, but that adjective cannot be applied to the man himself. He demarcated his field, then cleared and ploughed and harrowed it, and has left a fair tillage. Future students of Australian fishes will call him blessed. His series of reports upon the *Endeavour* collections are masterly, and have

called forth the encomiums of the doyen of ichthyologists, Dr. David Starr Jordan. His "Check List of the Fishes of New South Wales," which appeared first in this journal, and was subsequently issued as the first Handbook of the Royal Zoological Society of New South Wales is admirably planned, and still more admirably executed. His memoirs upon Australian ichthyology are too numerous to be mentioned here. All his work exhibits a clarity of expression, based upon a most exacting industry of research.

McCulloch did not, however, confine himself to fish alone. An ardent field-naturalist, he knew nature as a whole, and was as happy in the evil ooze of a mangrove swamp as upon the highest and most beautiful of coral isles. His personal investigations included a goodly slice of the Pacific, the whole east coast of Australia, including the Barrier Reef and its islands, and portion of Papua. In later years he spent much time at Lord Howe Island, recuperating after bouts of ill-health. He was a first-class photographer, and the lantern-slide collection of the Australian Museum has benefited greatly by the wonderful series of nature pictures which he added.

He was an artist to his finger-tips, a fact which is reflected from every aspect of his work. Apart from the beautiful series of drawings which illustrate his own researches, his pencil and brush were always at the disposal of his junior colleagues who were less fortunately gifted. Perhaps the most admirable feature in McCulloch's character was the interest he took in these junior workers. He made them all draughtsmen, he taught them all research methods, and he never failed them in advice and help. He leaves behind him a heritage of competency which is already putting forth good fruit. In a brief forty years of life he accomplished a fine work.

McCulloch's ashes have been brought from Honolulu, and reinterred on Flagstaff Hill, in the Lord Howe Island he loved so well. His colleagues and friends have subscribed to erect a granite column, twelve feet in height, which now stands facing the coral reef on which so much of his work was done. It bears the following inscription:—

IN MEMORY OF
ALLAN RIVERSTONE McCULLOCH,
NATURALIST.
1885-1925.
ERECTED BY FRIENDS AND FELLOW WORKERS.
HIS ASHES REST HEREIN.

May he rest well.

L.H.

ROYAL ZOOLOGICAL SOCIETY OF NEW SOUTH WALES.

New Members.

The following have been elected members of the Society since the publication of the last list (10th November, 1925):—

Ordinary members:—Messrs. Frank Buckle, Albert A. Lawson, A. Dattilo Rubbo, J. R. Tyrrell and G. P. Whitley.

Associate members:—Messrs. C. H. Anderson, P. R. Makinson, J. F. Newns, D. L. Serventy, and A. E. West.

Life Associate members:—Mr. W. H. Barkley (commuted), The Director, Dominion Museum, Wellington, N.Z., and Mr. Emil H. Zeck (formerly an ordinary member, but now residing in Mexico).

Donations to Handbook Publication Fund.

A further donation of £20 to the Handbook Publication Fund has been received from the Walter and Eliza Hall Trust. This makes a total of £90 contributed by the Trust. A donation of £1 has been received from Dr. F. G. Hardwick, of Lismore.

NOTES FROM THE ENTOMOLOGICAL SECTION.

At a meeting held on the 14th April, 1926, Dr. G. A. Waterhouse exhibited two Skippers, that constitute new records for Queensland. These had been sent him by Mr. E. J. Dummigan, and had been caught on the Bunya Mountains. *Signeta tymbophora* M. & L. had only been previously caught in the Illawarra district, N.S.W.

Anisynta tillyardi W. & L. Since its discovery at Ebor, N.S.W., this species had been found by him at Murrurundi and Barrington Tops, N.S.W., at both places at an elevation of about 3,000 ft.

He also exhibited a female moth *Cebysa leucoteles*, a form with aborted wings. This specimen had emerged in one of his cages and no less than 35 males were caught flying round the outside of the cage, being attracted by the female. He remarked that some years ago he had observed a greater swarm of males, but did not count the total number. When the female was allowed out of the cage and pairing had taken place, the rest of the males immediately flew away.

G. M. GOLDFINCH, Hon. Secretary.

CHECK LIST OF THE AUSTRALIAN TENEBRIONIDAE.

By H. J. CARTER, B.A., F.E.S.

CORRIGENDA.

The following species were inadvertently omitted.

375a. *Saragusoleatus* Cart., Roy. Soc. S.A., 1922, p. 297. Pearson Is., S.A.

379a. *S. posidonius* Cart., l.c., p. 296. Neptune Is., S.A.

758a. *Adelium bicolor* Cart., Linn. Soc. N.S.W., 1908, p. 182. Kosciusko.

A critic has suggested that Lord Howe and Norfolk Islands species should be included. Both islands are geographically rather in the New Zealand than in the Australian region, but some of the insects of the former have strong Australian affinities.

The following Tenebrionidae have been described from Lord Howe Island:—

Gonocephalum (*Hopatum*) *calvulum* Oll., Mem., No. 2, Aust. Mus., 1889, p. 87.

Brachycilibe antennata Cart., Linn. Soc. N.S.W., 1911, p. 207.

Saragus exulans Pasc., Jour. Ent., 1866, p. 466.

S. gulielmi Oll., Mem. No. 2, Aust. Mus., 1889, p. 88.

Promethis (*Nyctobates*) *sterrha* Oll., l.c., p. 88.

Hydissus (*Meneristes*) *curtulus* Oll., l.c., p. 90.

H. vulgaris Oll., l.c., p. 89.

From Norfolk Island. *Metisopus purpureipennis* Bates.

p. 152. *Ceradelium* Prendh. should be Preudh.

p. 179. *Thorictosoma cremogaster* Lea. Should be expunged as a *Nomen nudum*.

THE BIOLOGY OF NORTH-WEST ISLET, CAPRICORN GROUP.



1. Looking towards the Islet from the edge of the reef at low tide.

2. Large and small nigger-heads on the reef-crest, North-west Islet.

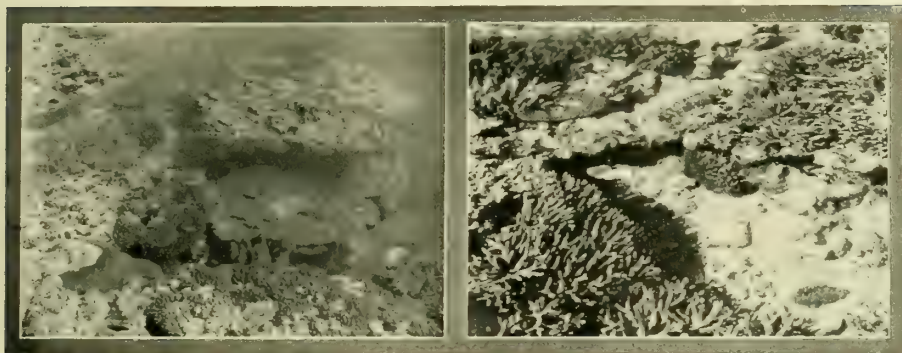


3. A large weathered nigger-head on the reef-crest; in the crevices Loricates shelter.

4. The turtle-canning factory from the reef; the *Pisonia* forest lies in the background.

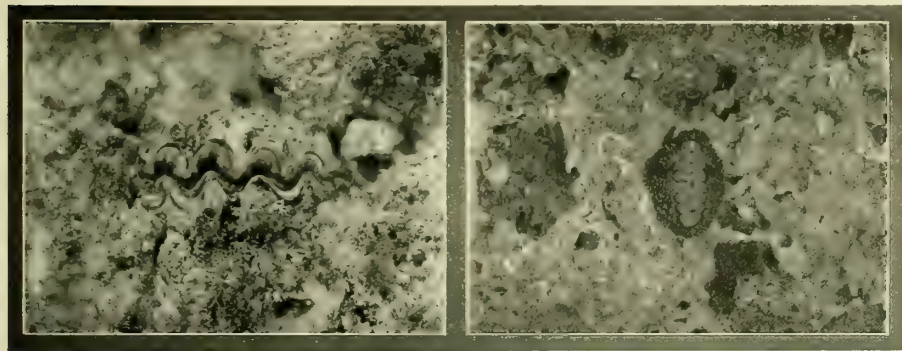
Photographs by A. Musgrave.

THE BIOLOGY OF NORTH-WEST ISLET, CAPRICORN GROUP.



1. Tabular madrepora corals in a pool on the reef-crest.

2. Stag-horn corals in a pool on the reef-crest.



3. A clam (*Tridacna*) with open valves. These occurred commonly on the reef and in the lagoon.

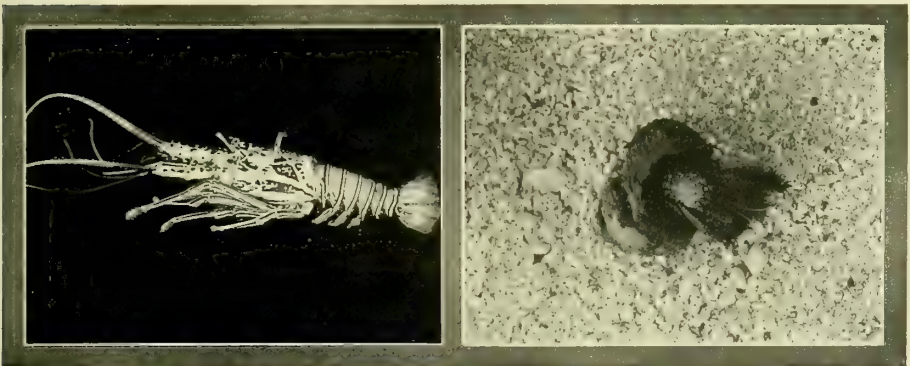
4. A Loricata sheltering in a crevice of a weathered nigger-head.

Photographs by A. Musgrave.

THE BIOLOGY OF NORTH-WEST ISLET, CAPRICORN GROUP.



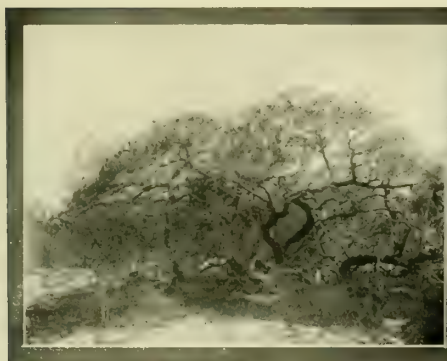
1. A Green Turtle (*Chelone mydas*), coming up the beach to lay her eggs.
2. Tracks of Green Turtles; on the bank are Turtles turned by the Cannery men.



3. The Painted Spiny Lobster (*Palinurus fasciatus*), found in the lagoon.
4. A brilliant tropical Hermit Crab (*Dardanus megistos*), found in a pool on the reef.

Photographs by (1) Miss Hilda Geismann, (2) Dr. W. MacGillivray, (3) and (4) A. Musgrave.

THE BIOLOGY OF NORTH-WEST ISLET, CAPRICORN GROUP.



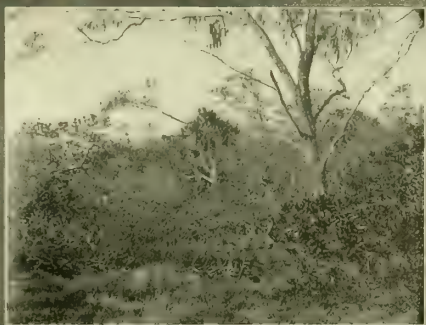
1. The silvery-leaved *Tournefortia argentea* occurred commonly near the beach.



2. The greenish-yellow berries of *Tournefortia* grow in clusters.



3. The Native Cabbage (*Scaevola koenigii*), a common plant of the beach zone.



4. Typical plants of the beach zone, *Tournefortia* (left), *Scaevola* (right), *Casuarina* (Beach Oak), and *Pandanus*.

Photographs by A. Musgrave.

THE BIOLOGY OF NORTH-WEST ISLET, CAPRICORN GROUP.



1. The trunks of *Pisonia* trees growing near the beach assume fantastic shapes.

2. A seed-laden *Pisonia* tree. The sticky seeds clog the feathers of birds, often with fatal results.

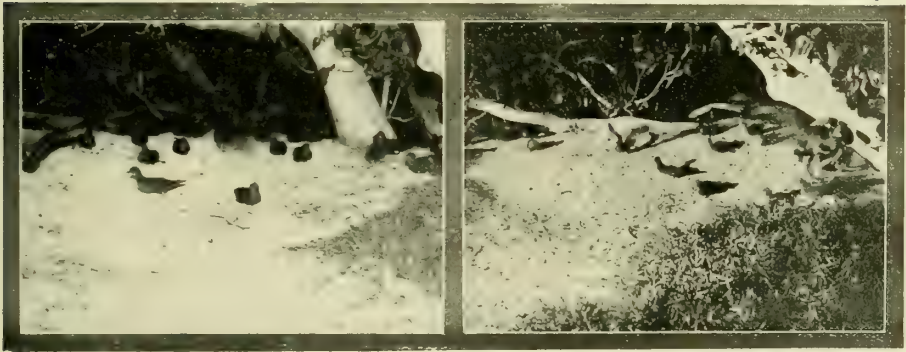


3. An inland glade in the *Pisonia* forest.

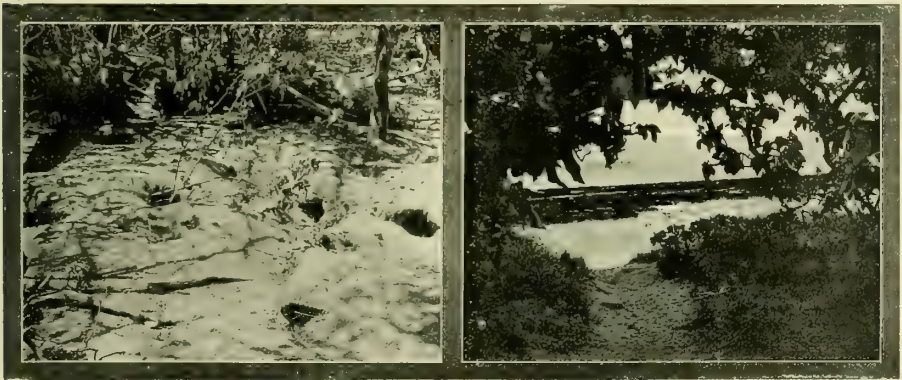
4. A glimpse seaward through the *Pisonia* branches.

Photographs by A. Musgrave.

THE BIOLOGY OF NORTH-WEST ISLET, CAPRICORN GROUP.



1-2. Wedge-tailed Shearwaters or Mutton-Birds leaving one of the "take-off" places at 4 a.m. Photographs taken by flashlight.



3. Mutton-Bird burrows in sandy soil amongst the *Pisonia* trees, North-west Islet.

4. A Mutton-Bird "take-off" place by daylight. The path is worn clear of vegetation by long use.

Photographs by (1) P. A. Gilbert, (2-4) A. Musgrave.

THE BIOLOGY OF NORTH-WEST ISLET, CAPRICORN GROUP.



1. Young Reef Herons in the top of a *Tournefortia* awaiting the parents.



2. Adult Reef Heron approaching its nest.



3. Nest of White-bellied Sea Eagle in the top of a *Pisonia* tree. Eaglet at home.



4. Immature White-bellied Sea Eagle.

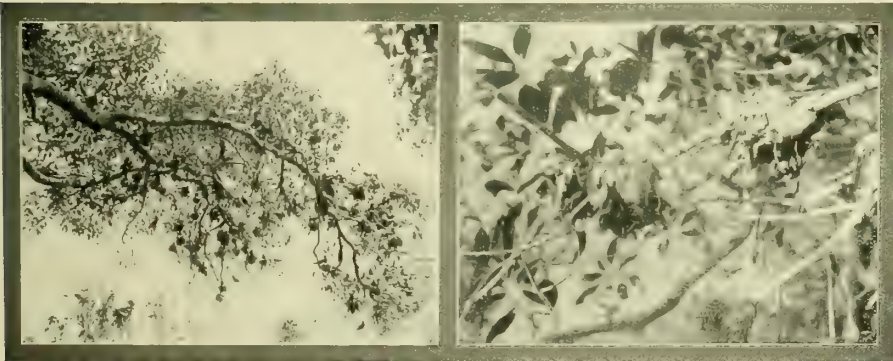
Photographs by (1, 2 and 4) P. A. Gilbert, (3) A. Musgrave.

THE BIOLOGY OF NORTH-WEST ISLET, CAPRICORN GROUP.



1. White-capped Noddy covered with the sticky *Pisonia* seeds, and unable to fly.

2. White-capped Noddy on its nest.

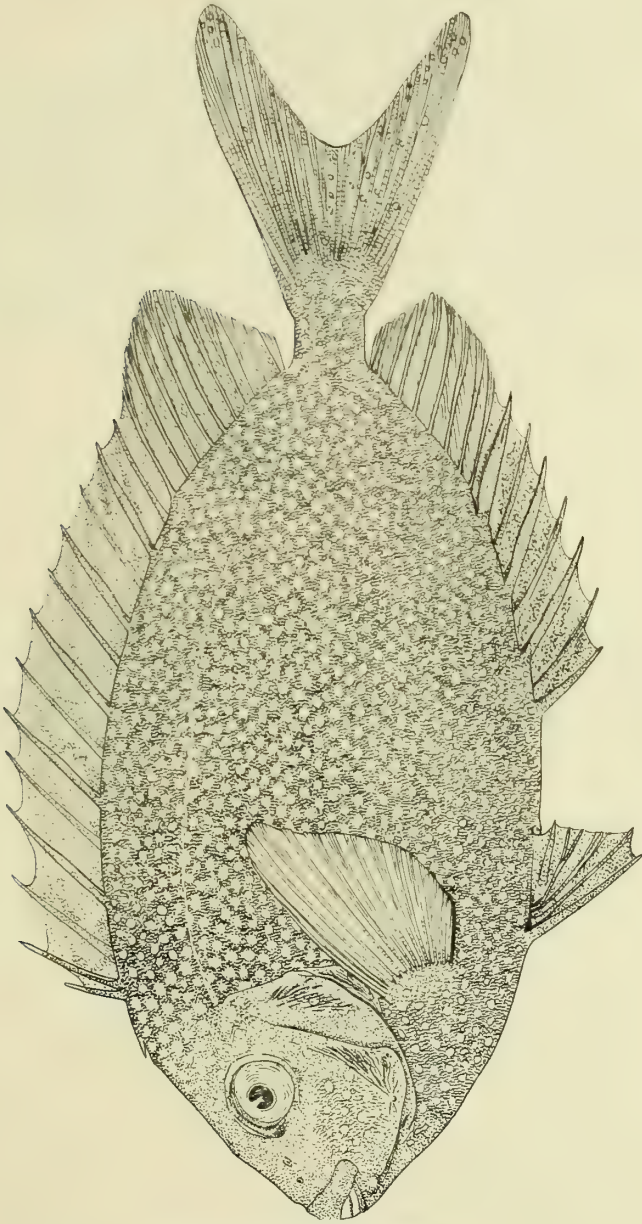


3. White-capped Noddies' nests on the limb of a Fig-tree.

4. Two nests of the White-capped Noddy, each containing a single egg.

Photographs by (1 and 2) P. A. Gilbert, (3 and 4) A. Musgrave.

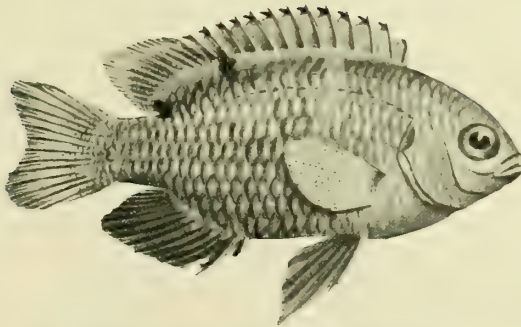
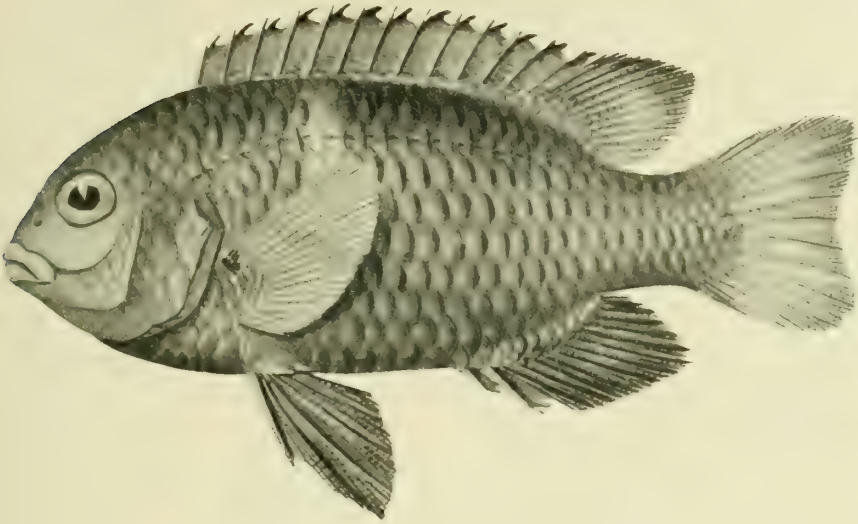
THE BIOLOGY OF NORTH-WEST ISLET, CAPRICORN GROUP.



Siganus capricornensis Whitley.
About 2/3 natural size.

G. P. Whitley, *del.*

THE BIOLOGY OF NORTH-WEST ISLET, CAPRICORN GROUP.

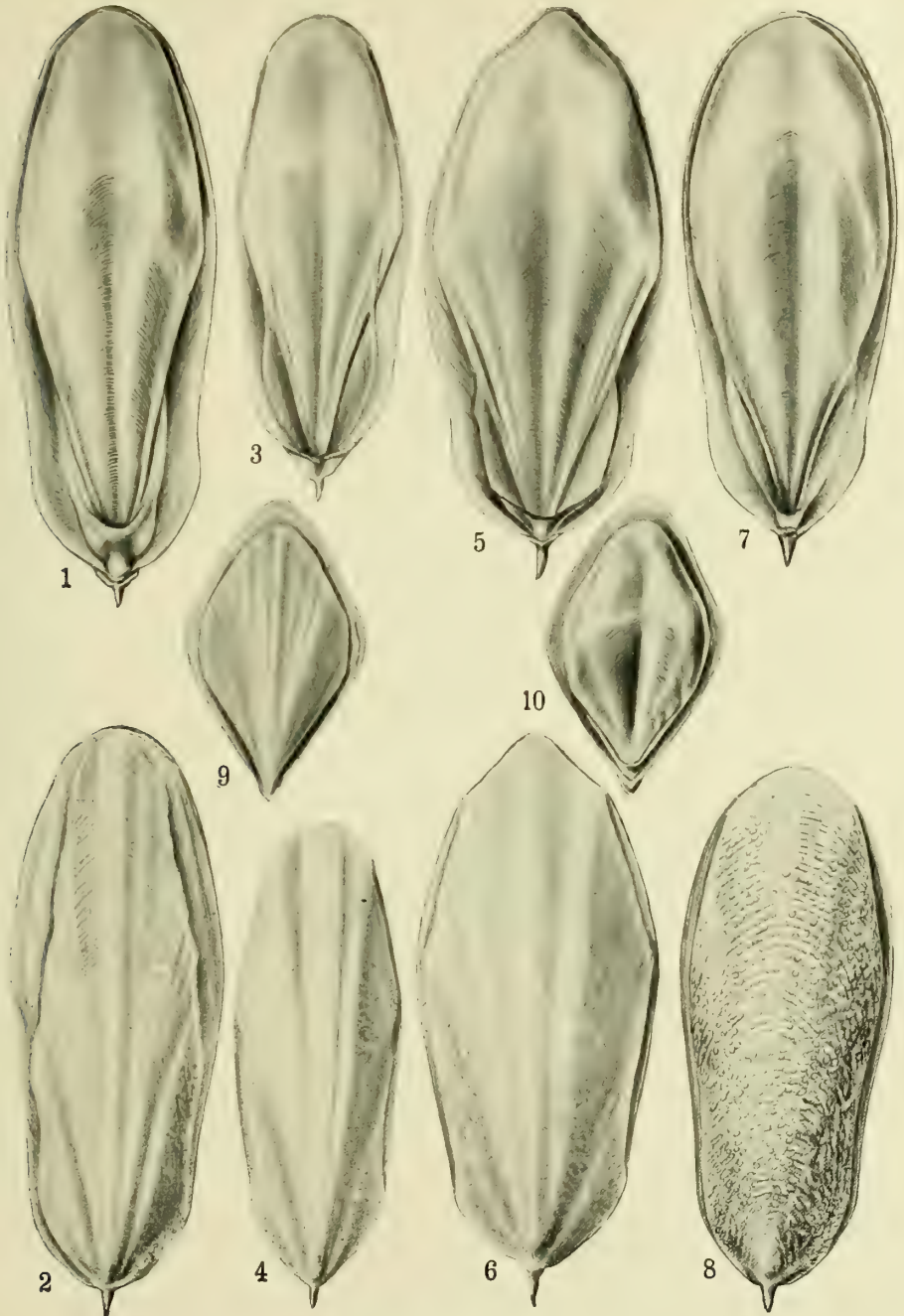


Glyphisodon zonatus Cuvier & Valenciennes.

A series of New Hebrides specimens: enlarged.

A. R. McCulloch, del.

THE BIOLOGY OF NORTH-WEST ISLET, CAPRICORN GROUP.



CUTTLE-FISH BONES.

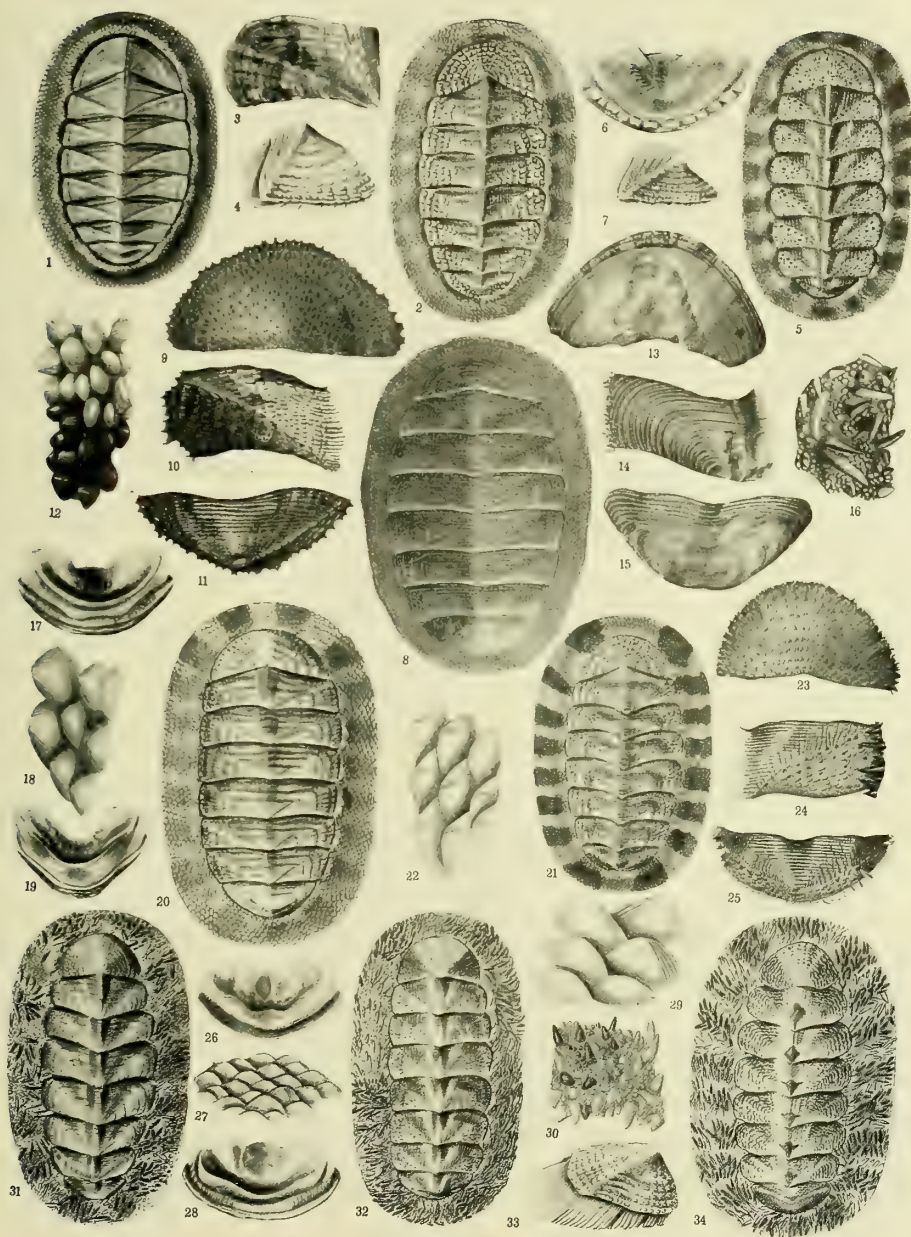
Drawn by Joyce K. Allan.

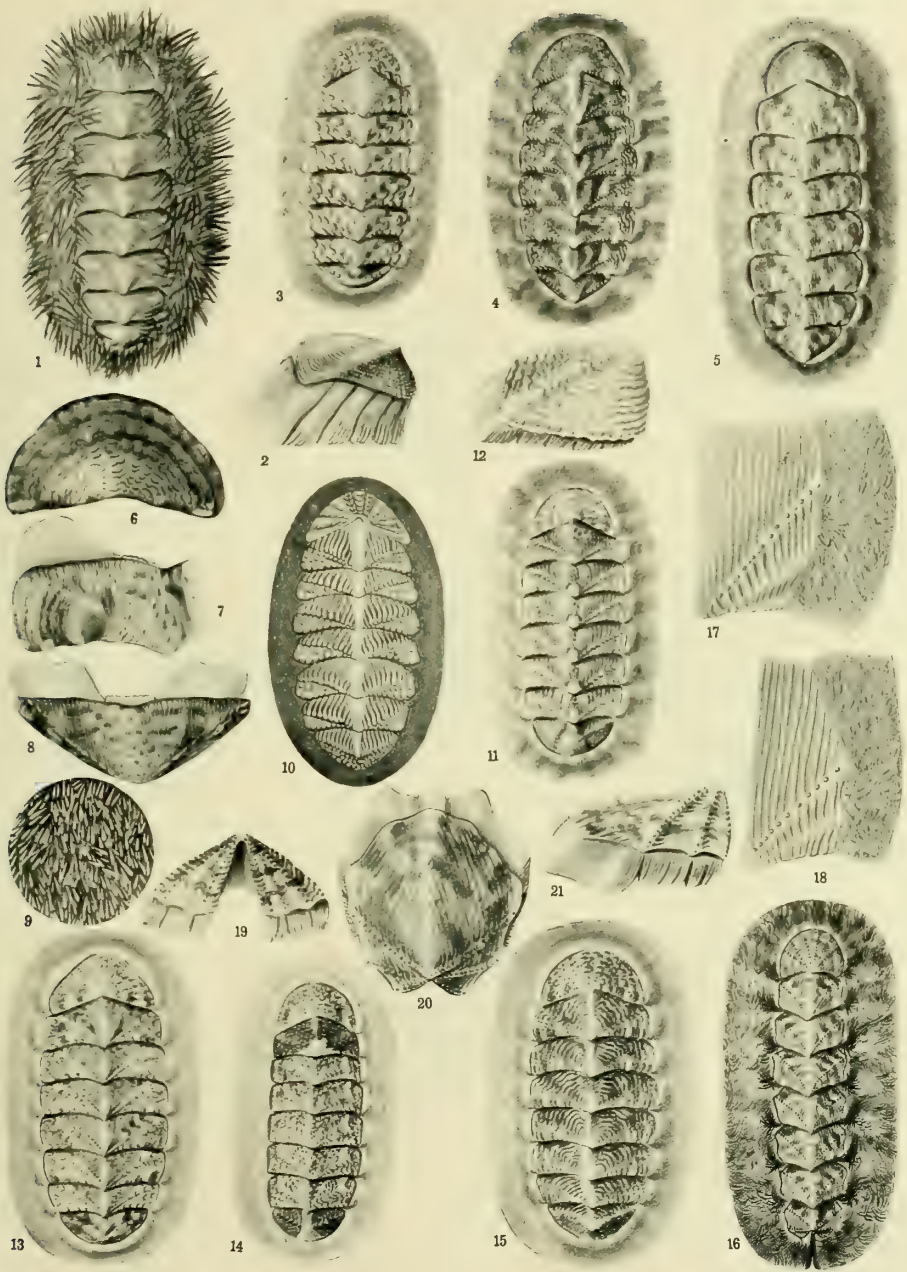
THE BIOLOGY OF NORTH-WEST ISLET, CAPRICORN GROUP.

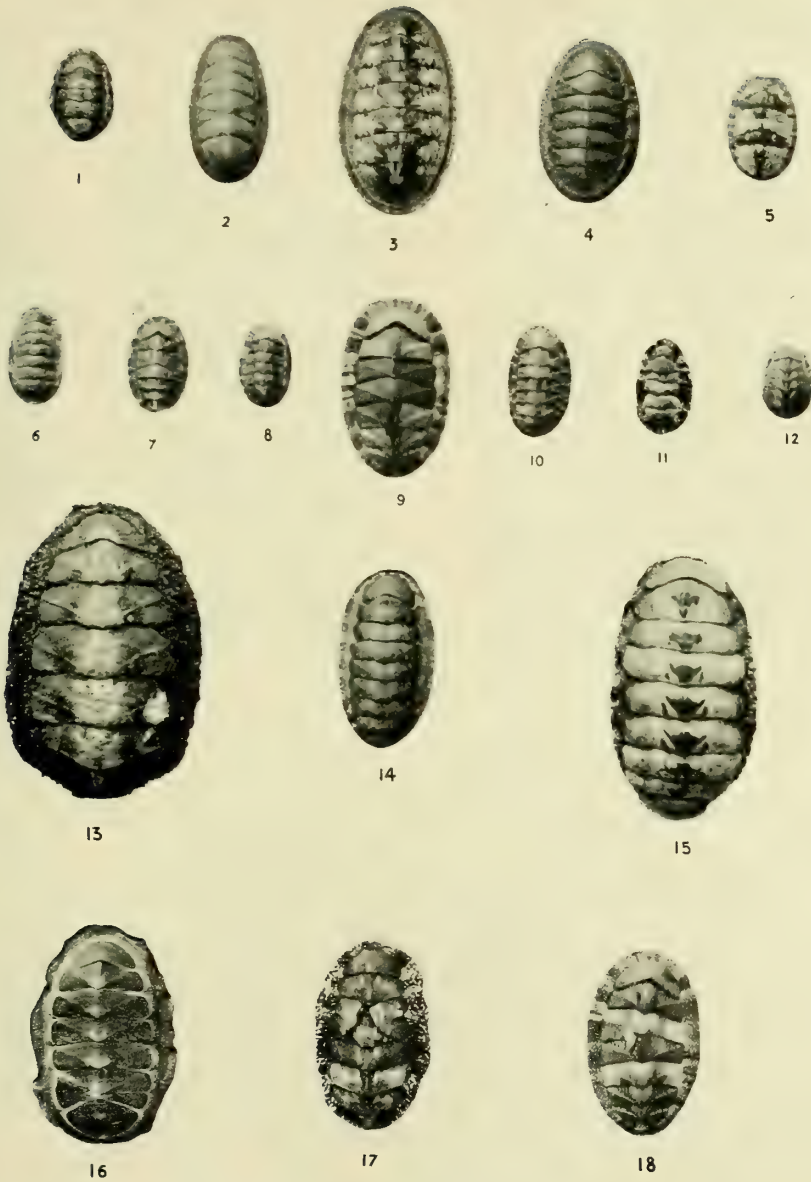


1. *Chlorion gilberti* Turner x 2. 2. *Arunta intermedia* Ashton x 1.
3. *Salix* (*Priocnemis*) *bicolor* Fabricius, x 2.

Miss G. Burns, del.







ABNORMAL AUSTRALIAN LORICATES.

Photograph by A. A. Lawson, Ltd.

THE LATE ALLAN RIVERSTONE McCULLOCH.



Service when the ashes were laid.

Photograph by N. C. Berry.



The completed monument.

Photograph by E. F. Pollock.



The Monument is erected under the group of Kentia Palms on the left of the picture.

Photograph by the late A. R. McCulloch.

Royal Zoological Society of New South Wales.

PUBLICATIONS.

"The Australian Zoologist"

A Journal containing reports of the proceedings of the Society, papers relating to the Zoology of Australia, notes and comment upon matters coming within the scope of the Society's aims and objects. Published at irregular intervals.

VOLUME I. (1914-1920). Parts 1 to 8.

256 pp. with 19 plates and 63 text figures. Unbound. Price £1 net.

VOLUME II. (1921-2). Parts 1 to 4.

172 pp. with 45 plates and 16 text figures. Unbound. Price 12/6 net.

VOLUME III. (1922-5). Parts 1 to 8.

362 pp. with 41 plates and 27 text figures. Unbound. Price £1 net.

VOL. IV. PART 1. Published 12th June, 1925. Price, 4/-.

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VOL. IV. PART 3. Published 22nd February, 1926. Price, 6/-.

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AUSTRALIAN ZOOLOGICAL HANDBOOKS.

No. 1. Check-List of the Fishes and Fish-like Animals of New South Wales,
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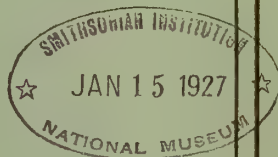
THE AUSTRALIAN ZOOLOGIST

Issued by the
Royal Zoological Society of New South Wales

Edited by
A. F. BASSET HULL, C.F.A.O.U.

Vol. 4—Part 5

(Price, 4/6.)



Sydney, November 30, 1926.

All communications to be addressed to the Hon. Secretary,
Box 2399, General Post Office, Sydney.

Sydney:

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Royal Zoological Society of New South Wales.

Established 1879.

REGISTERED UNDER THE COMPANIES ACT, 1899 (1917).

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Chairman: J. R. Kinghorn, C.M.Z.S.

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Marine Zoological Section.

Chairman: T. C. Roughley.

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SUBSCRIPTION: Ordinary Member, £1 ls. per annum. (Entrance Fee of £1/1/- is suspended until the end of the current year).

Life Member, £10/10/-.

Associate Member, 7s. 6d. per annum. (No Entrance Fee).

Life Associate Member, £3/15/-.

PRIVILEGES:

Ordinary Members—Free admission to Taronga Zoological Park; Additional Tickets admitting 20 Adults or 40 Children each year; Free Copy of "Australian Zoologist." (if desired).

Associate Members—Free Copy of "Australian Zoologist."

"THE AUSTRALIAN ZOOLOGIST."

Communications intended for "The Australian Zoologist" should be type-written.

Authors should state whether proofs and reprints are desired when submitting MS. Fifty reprints of any article appearing under a separate title will be supplied gratis. If more are required, terms may be ascertained on application to the Editor.

Royal Zoological Society of New South Wales

ANNUAL REPORT, 1925-6.

Membership.

On 30th June, 1926, there were 403 members on the Register, divided into the various categories as follows:—Life members 27, ordinary members 248, life-associate members 14, associate members 108, and honorary members 6. Eight members died during the year, six resigned, the names of nine members were removed from the register, and twenty-seven new members were elected, giving a net increase of three members. The Society has suffered heavy loss by the deaths of no less than three members of Council, Mr. Donald Hyde Scott, who held the office of honorary treasurer at the time of his death, Mr. Allan Riverstone McCulloch, a member of Council of the old Society, who also held office on the Council of the incorporated Society from its inception until his early and lamented decease, and Mr. Hermann Edward Finckh, the longest in office, and one of the most constant in his attendances at Council meetings. Sir Hugh Dixon, K.B., and Mr. C. H. Hoskins, both members for many years, and both donors to the Handbook Publication Fund, Miss E. E. Chase, a promising young zoologist, who was lecturer and demonstrator in Zoology at the Sydney University, Mr. Joseph James Fletcher, formerly secretary to the Linnean Society of New South Wales, and a scientist of the highest standing, and Mr. E. W. Gregory also died during the year.

The Council.

Seven meetings of the Council were held during the year, at which the attendances were:—Mr. Halloran, Dr. Waterhouse, Messrs. Musgrave and Hull, 7; Dr. Ferguson and Mr. Nicholson, 5; Professor Harrison, Messrs. Froggatt, Kinghorn, Shipway, Stewart, Pollock, and Troughton, 4; Messrs. Finckh and Stead, 3; Messrs. Campbell and Dixon, 2; Dr. D'Ombraïn and Mr. Cayley, 1. Mr. Campbell, who was appointed Deputy-Master of the Mint at Ottawa, Canada, resigned on 11th February, 1926; Mr. Finckh died on 31st May, 1926; Mr. Dixon was elected on 27th July, 1925; Mr. Troughton and Mr. Stead were elected on 1st October, 1925; Mr. Cayley was elected on 11th March, 1926, and Mr. Bryce was elected on 24th June, 1926, at the last meeting held during the year.

Sections.

Very great interest continues to be taken in the Entomological and Ornithological Sections which, commencing with six meetings in the year, now meet every month except December, and occasionally hold extra meetings to meet distinguished naturalists who are visiting Sydney. The Biological Section, and the Section of Economic Zoology have not held any regular meetings, and the establishment of a Section of Marine Zoology was only approved at the end of the year.

The Australian Zoologist.

The Society's journal appeared three times during the year, the Parts being the largest yet issued; both subjects treated and plates produced being of exceptional interest. The first coloured plate was issued during the year. Numerous letters of appreciation have been received from scientists abroad, and a number of applications to be placed on the exchange list have been made by British and foreign scientific societies and universities not previously in receipt of our publications, which are now regularly sent to 76 scientific institutions.

Finances.

The Society is holding its position financially, but there is room for improvement in the ordinary membership, the number of members who receive passes to Taronga Park being somewhat smaller than usual. A full membership of 300 is earnestly desired, and members are invited to nominate new recruits to fill the vacancies that occurred during the year.

Donations.

During the year the Society received a further contribution of £20 towards the Handbook Publication Fund from the Walter and Eliza Hall Trust, bringing that Trust's donations to a total of £90. Dr. F. G. Hardwick, of Lismore, donated £1/1/-, and Mr. A. A. Lawson, senior, presented the Society with a valuable microscope for use in connection with micro-photography. The thanks of the Society are due to all these donors.

Retirement of Mr. E. F. Pollock.

The President referred to the retirement of Mr. E. F. Pollock from the position of Honorary Secretary, the duties of which office had been performed by him in an admirable manner for a period of two years, and the thanks of members for such long and meritorious service were tendered to him.

Retiring Councillors.

The following members of Council retired in terms of Article 23, and were re-elected:—Messrs. Ernest Bryce, Neville W. Cayley, Robert C. Dixon, A. F. Basset Hull, David G. Stead, and E. L. Troughton.

PRESIDENTIAL ADDRESS.

By AUBREY HALLORAN, B.A., LL.B.

Review of the Past Decade.

On 1st July, 1916, the collections of animals and birds, together with the other properties of the original Society excepting the library, were handed over to the Trustees of Taronga Zoological Park, and the then recently incorporated Society entered upon its new duties. These duties are set out in its Memorandum of Association, and need not be recapitulated here.

Of the various objectives open to attainment, four have received special attention, with results that may be regarded as satisfactory in view of the very limited means at the disposal of the Society.

1. *"The Australian Zoologist."* This publication was launched during the period when the Society controlled the Zoological Gardens at Moore Park, and three parts were issued—No. 1 in June, 1914, No. 2 in February, 1915, and No. 3 in March, 1916, aggregating 64 pages, with 5 plates. During the first year under the incorporated Society, two parts were issued, containing 74 pages, 7 plates and numerous text-figures. The issues during the following financial years (1 July to 30 June) were as follows:—

1918-19.—One part, 60 pages, 2 plates.

1919-20.—One part, 30 pages, 3 plates.

1920-21.—Three parts, 98 pages, 25 plates.

1921-22.—Two parts, 104 pages, 22 plates.

1922-23.—Three parts, 124 pages, 17 plates.

1923-24.—Three parts, 114 pages, 16 plates.

1924-25.—Three parts, 160 pages, 12 plates.

1925-26.—Three parts, 244 pages, 35 plates.

The total output since the registration of the Society has been therefore 21 parts, containing 1,008 pages, 139 plates and over 100 text-figures.

2. *Australian Zoological Handbooks.* So far only one Handbook has been issued, A. R. McCulloch's "Fishes of New South Wales." The increased cost of printing has prevented the Society from carrying out this objective to the extent desired, although it is probable that another work will shortly be issued.

3. *Biological Stations.* Through the generosity of the Trustees of the National Park a cottage and an observation cabin have been provided at different parts of the Park, and furnished by the Society. Work in connection with a biological survey of the National Park has been commenced.

4. *Work in Conjunction with Kindred Societies.* The Society has joined forces with the Royal Australasian Ornithologists' Union in promoting the study of ornithology and the protection of Australian avifauna. Meetings of the Ornithological Section of the Society are open to all members of the Union, whether they are members of the Society or not, and the business of the Union in this State is largely transacted at the Society's office.

The Society is also represented on the Committee appointed to advise the Commonwealth Government on matters relative to the export of Australian fauna, and on the Great Barrier Reef Investigation Committee.

5. *Sections.* Although not expressly referred to in the Memorandum of Association, the establishment of Sections to deal with special subjects has been most successful. Sections in Entomology, Ornithology, Biology, Economic Zoology, and Marine Zoology have been established, and the meetings, especially of the two firstnamed, are largely attended by enthusiastic students and their friends. These meetings are open to all members who care to attend.

Conservation.

An American opinion of the value of conserving a natural fauna and flora is expressed in *Nature Magazine* for June, 1926, in a review of a work entitled the *Naturalists' Guide*. "The keynote of this notable book is Conservation, the preservation in its natural state, for all rational purposes, of as much as possible of the rich biota of America. Our wealth of natural life has served well the springs of literary and artistic expression, and constitutes a laboratory for the study of many phases of science of inestimable value in both inspirational and material lines. Thoughtful minds view with distress the headlong wasting of our fauna and flora, sacrificed all too often to the demands of an ignorant and vulgar commercialism. Duty to ourselves and our descendants requires that we use every effort to pass on to posterity at least a portion of the priceless wealth that has been ours. The task is a hard one, but it is only by striving for a worthy ideal against great odds that man has risen from barbarism, and he has still far to travel."

These stirring words are *a fortiori* applicable to the wonderful fauna and flora which are the exclusive inheritance of this vast island continent. Australia—the land of living fossils—as another American scientist has aptly described it, contains many animals, birds, and plants found in no other quarter of the globe, and once exterminated they can never be restored to us. The United States of America have already lost some of their birds and animals by the senseless destruction for food or the mere lust of slaughter, the Passenger Pigeon and the Bison may be cited as notable examples. The Bison has been restored to a small extent at enormous expense by obtaining stock from Canada. The few remaining Elk and Moose are now jealously protected and carefully guarded in well-policed sanctuaries. When will Australia awake to the urgent need of following America's example? Our so-called sanctuaries are left unguarded by any but the ordinary police, already overburdened with urban and other duties, or "honorary" rangers who are virtually powerless.

The Economic Aspect.

Not only from a scientific, or even a sentimental point of view is conservation to be commended—it has also an economic or commercial aspect. Many of our fur-bearing animals and the more attractive birds which are capable of being kept in captivity are the subject of extensive exportation—the skins of the animals in millions and the living birds in thousands annually leaving our shores. Uncontrolled exploitation of these valuable natural products can only lead to ultimate extinction. It is true that in most of the States there is partially protective legislation in respect of some of the rarer species, but the efforts to enforce this legislation are insufficient to ensure the full observance of the law. The excuse—we cannot call it reason—for this state of affairs is the question of cost of maintaining a special force to police reserves and Crown lands. There are good answers to this excuse; why not impose an export duty on every skin, living animal or bird; or/and require hunters and trappers to pay an annual license fee? Not a foot of Crown land can be occupied without payment of rent or purchase money; not a foot of Crown timber can be cut without payment of royalty; not an ounce of gold or a ton of Crown mineral can be won without payment of rent, royalty, or a fee for a miner's right; the Crown fish can only be exploited for commercial purposes by licensed fishermen. Why then should the Crown-owned wild animals and birds be free to anyone who wishes to take them? It is true that the taking of game birds in season for sale is subject to a license, but the thousands of Crown-owned

cockatoos, and parrots that are exported to foreign countries are subject to not one farthing by way of license or royalty. Some of these birds bring as many pounds abroad as they cost in pence at home, and the payment of a reasonable royalty on them would only be a fair charge in keeping with the timber and mineral royalties, and it would make ample provision for the upkeep of a corps of rangers who would regulate the taking of unprotected and enforce the protective laws relating to protected animals and birds.

Closer Relationship.

I wish to particularly stress the importance of closer relationship between the Society and the Trustees of Taronga, National, and some other Parks. There should be direct representation of the Society on the Taronga Park Trust; the home of the Society should be there. The Zoological Society of London actually controls its own gardens, and has its scientific meetings there. Past Ministers for Lands promised that there would be such representation, but so far nothing has been done.

Zoological Survey of Australia.

A Zoological Survey of Australia should be proceeded with at once. This was referred to in an excellent Presidential Address of Dr. G. A. Waterhouse before the Linnean Society in 1923. During the year there appeared in *The Australian Zoologist* a noteworthy group of articles entitled "The Biology of North-west Islet." These were written by members of this Society as the result of a well organised trip made there last year, which produced valuable records. One of our aims should be to encourage such trips as these, for it has been abundantly proved that the intensive study of limited areas of particular zoological interest, by as large a party of naturalists as possible, produces the best results. What would we give now to have a record of the fauna of Sydney itself as it was one hundred and fifty years ago? It can only be surmised from the surrounding country, and even that is fast losing its animals and plants before its investigation is quite completed. Other countries place some importance upon their animals, but in Australia little is done to preserve them or to help the naturalist in his study of them, until some animal becomes a pest, and then the naturalist is expected to suggest a remedy straight away.

Voluntary Service.

It should not be forgotten that most of the Natural History work of the past century has been done in a purely honorary capacity by men and women who love nature and natural history for its own sake. The few, and they are far too few, who hold official appointments have far too much that they are supposed to supervise, and are so hampered by routine work that they can accomplish very little. New South Wales needs another Sir William Macleay, who during his busy life worked as a naturalist, helped it by his generosity, which still continues by the benefactions in his will. The great German work on the butterflies and moths of the world, begun in 1906 under the editorship of Dr. A. Seitz, owes its origin to a suggestion made to Dr. Seitz by Sir William Macleay when the former was on a visit to Australia.

The keynote of the Society is voluntary service for obtaining and spreading information relative to and the protection of our unique fauna. I trust that greater interest will be taken in such an important scientific matter, that there will be an increase in membership of the Society, and that a generous public will realise that the Society is in need of liberal donations to properly carry on the work.

Alteration of Articles.

By resolution, duly carried at the Annual General Meeting, the following alterations have been made in the Articles of Association of the Society:—

Article 5 has been amended by the addition of the words "(d) honorary associate members, not exceeding at any one time five in number for each section of the Society."

Article 14 has been amended by the addition of the words "Honorary associate members shall be persons non-resident in New South Wales who have rendered distinguished service to Australian Zoology. They shall be elected by a majority of the Council present at a meeting thereof, upon nomination by a duly convened meeting of a section of the Society. Honorary associate members shall be entitled, for such period as the Council may determine on election, to all the privileges and rights of associate members."

Annual Dinner.

This function, which was held at the Sydney University Union prior to the Annual General Meeting, was attended by about 50 members and their friends.

Officers for 1926-27.

At a meeting of Council, held on 27th July, 1926, the following members were elected officers for the year ending 30th June, 1927:—

President: A. J. Nicholson, M.Sc., F.E.S.

Vice-Presidents: Dr. E. W. Ferguson, Professor L. Harrison, Dr. G. A. Waterhouse, and Aubrey Halloran, B.A., LL.B.

Honorary Secretary and Editor: A. F. Basset Hull.

Honorary Treasurer: D. G. Stewart, B.A.

Honorary Librarian: Philip Shipway.

Honorary Auditor: E. E. Coates.

New Members.

The following new members have been elected since publication of the last list (30th April, 1926):—

Ordinary Members:—F. Arnott, Samuel Arnott, G. Bambury, Miss R. Bambury, Mark Blow, A. H. Chisholm (formerly Associate), Dr. A. J. P. Chapman, H. W. Cotton, T. C. Roughley, A. Royce, Mrs. Royce, M. Ward, H. Wolstenholme (formerly Associate).

Associate Members:—Mrs. Benham, K. F. Branch, W. Boardman, Alan P. Dodd, E. M. Hayward, A. A. Livingstone, F. A. McNeill, J. H. Power.

Life Associate Members (commuted):—Professor W. E. Agar, J. H. Campbell, E. P. Fleming, J. W. Wilkinson, A. E. West, and G. H. Williams.

ROYAL ZOOLOGICAL SOCIETY OF NEW SOUTH WALES

BALANCE SHEET FOR THE YEAR ENDING 30th JUNE, 1926.

LIABILITIES.

	£	s.	d.
Capital Account	691	5	0
Income Account	29	4	3
Handbook Fund Account	217	17	6
	£938	6	9

ASSETS.

	£	s.	d.	£	s.	d.
Inscribed Stock Capital Account (face value £700)				691	5	0
Income Account:—						
Commercial Banking Co. of Sydney	5	7	6			
Government Savings Bank . .	23	16	9			
				29	4	3
Handbook Fund Account:—						
War Bonds (face value £200)	188	5	0			
Government Savings Bank . .	29	12	6			
				217	17	6
				£938	6	9

HANDBOOK FUND ACCOUNT.

RECEIPTS.

	£	s.	d.
Balance from 30th June, 1925	235	7	5
Donation (Walter and Eliza Hall Trust)	20	0	0
Sales "Fishes" Handbook	10	8	
Interest	11	19	5
	£267	17	6

DISBURSEMENTS.

	£	s.	d.	£	s.	d.
Transfer to Income Account				50	0	0
Balance 30th June, 1926—						
Government Savings Bank . .	29	12	6			
War Bonds	188	5	0			
				217	17	6
				£267	17	6

INCOME ACCOUNT.

RECEIPTS.

	£	s.	d.	£	s.	d.
Balance from 30th June, 1925				113	14	7
Annual Subscriptions—						
Year ending 30th June, 1926 . .	266	10	9			
Year ending 30th June, 1927 . .	10	11	6			
				277	2	3
Life Subscriptions				25	10	0
Donations				1	3	6
Government Grant				50	0	0
Sales "Zoologist" (inc. reprints) . .				6	10	6
Sale of Dinner Tickets				7	10	6
Transfer from Handbook Fund Account				50	0	0
Interest				44	16	9
	£576	8	1			

DISBURSEMENTS.

	£	s.	d.	£	s.	d.
Publication Account—						
Printing	296	17	5			
Blocks, etc.	132	14	5			
				429	11	10
Office Accommodation				52	0	0
Printing and Stationery				23	14	6
Books				14	1	0
Petty Cash				12	10	0
Cost of Annual Dinner				8	4	6
Miscellaneous				7	2	0
Balance on 30th June, 1926—						
Commercial Banking Co. . . .	5	7	6			
Government Savings Bank . .	23	16	9			
				29	4	3
				£576	8	1

Audited and found correct.
7th July, 1926.

EDW. E. COATES, Hon. Auditor.

D. G. STEWART, Hon. Treasurer.

Representation on the Taronga Park Trust.

By notice in the New South Wales Government Gazette, of 8th October, 1926, Mr. A. F. Basset Hull has been appointed a Trustee of Taronga Zoological Park, in place of the late Hon. H. C. Hoyle. The appointment was made on nomination by the Council of this Society, and on the recommendation to the Minister of the other members of the Trust. It is a matter for congratulation that the wish expressed by the President in his address has thus met with early fulfilment. Mr. Hull has recently spent some months studying the natural history of New Caledonia, where he procured many interesting and valuable specimens for the Australian Museum, together with a fine series of *Kagus* and other birds for Taronga Park. Upon his return he received a notification that he had been elected Correspondent of the Academy of Natural Sciences, Philadelphia, in recognition of his scientific work.

Taronga Aquarium.

The Aquarium under construction at Taronga Park will be ready for opening about the end of this year. The structure is very well carried out in imitation rock work with cave effects, stalactites, and other attractive details, all of which will be lighted with subdued coloured concealed lights.

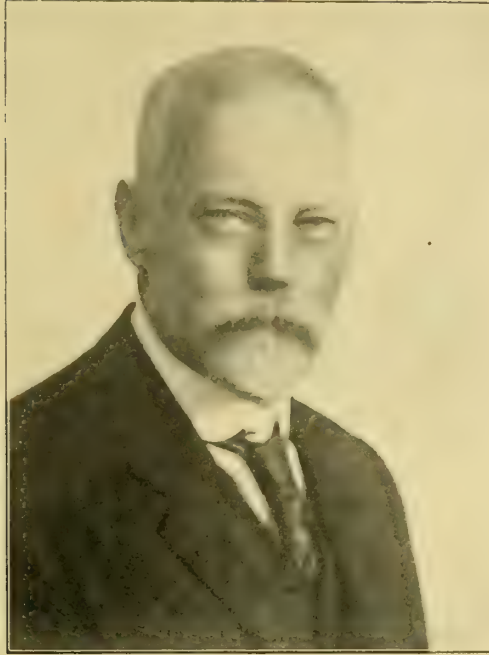
Members of this Society will not be granted free admission to the Aquarium, but will be required to pay on the same scale as members of the public.

OPOSSUMS IN NEW ZEALAND.

New Zealand News and Views for June, 1926, contains the statement that opossums, introduced from Australia and Tasmania, have multiplied greatly in New Zealand, where the animals' appreciation of the forest food and climate is shown in the excellent quality of fur.

During the previous trapping season licenses were issued by Acclimatization Societies to more than 700 trappers, who collected a total of 146,000 skins. The largest yields were: Wellington district, 50,239; Otago, 24,366; Westland, 15,665; Nelson, 11,146.

From this illuminating account we may gather that when the opossum becomes extinct in Australia as a result of cyanide poisoning, indiscriminate shooting, and absence of effective protection, it will still survive in other countries where it receives some measure of intelligent appreciation.



*Sincerely yours
Charles Hedley.*

Australian scientists and those members of our Society who had the privilege of his acquaintance mourn the loss of one of the greatest and most lovable of men. Paul's eulogy of the Corinthians might well have been applied to Charles Hedley, for he "suffered fools gladly, he himself being wise." Many a poor stammering entrant into the marvellous world of scientific knowledge owes his advancement to the helping hand held out by Charles Hedley. Courteous, kindly sympathetic, always ready to find and encourage the germs of usefulness in the beginner, his advice and valuable suggestions brought out the best in those who were fortunately led to consult him.

Born in England in 1862, Hedley came to Australia as a young man, and for a while was on the land in Queensland. In 1889 he joined the staff of the Queensland Museum, and later accompanied Sir William Macgregor to New Guinea as naturalist attached to the expedition. In 1891 he came to Sydney and joined the staff of the Australian Museum, being appointed conchologist of that institution in 1896. He was assistant curator in 1908, and acted as curator on the death of R. Etheridge, junior, in 1920. In 1925 he retired from the Museum in order to accept the post of scientific director of the Great Barrier Reef Investigation Committee, a position which he held at the time of his sudden death on 14th September, 1926.

He was the author of upwards of 200 scientific papers, chiefly on conchological subjects, although some of his most valuable and suggestive articles related to zoogeography. There were few fields of scientific study in which he had not usefully tilled. A vigorous traveller, he had visited many parts of the globe, although his most fruitful expeditions were made in Australia, New Guinea, and the Pacific Islands.

As a member of Council of this Society and one time President, he did much to elevate its aims and further its interests. As one of the Museum staff he was indefatigable, and from his private means he enriched the collections and library with numerous valuable specimens and rare books on scientific subjects. In every way he was one of those men whose loss will be felt by both individuals and the community.

H. C. HOYLE.

The Hon. Harry C. Hoyle, one of the Trustees of Taronga Zoological Park appointed on its inception, died on 20th July, 1926. Mr. Hoyle was one of the Government representatives on the Council of the Royal Zoological Society of New South Wales prior to its incorporation, and was very prominent in the early negotiations which led to the selection of the new site for a zoological gardens. He was an eloquent speaker, and ably filled the position of Treasurer in the Holman Ministry, 1914-1916.

REPORTS OF THE SECTIONS.

ENTOMOLOGICAL SECTION.

During the past twelve months, eight ordinary meetings and one special meeting have been held, with an average attendance of over twelve. At these meetings, ten visitors have been present.

At a meeting, held on the 10th January, it was decided that the section meet on the second Wednesday in every month, except during January. That this has been appreciated is evidenced by the increase in the average attendance during the session.

During the year, it was decided to set down special subjects for discussion at certain meetings during the year. This procedure has been very successful.

The first meeting was devoted to the narration of some entomological ex-

perience by each member present. This provided an interesting evening, as each member had something unique to relate.

Mr. E. M. Hayward, at another meeting, gave a very informative account of the zoology and anthropology of the Philippine Islands. Mr. A. J. Nicholson has opened a discussion upon the geographical distribution of insects, a subject which will be discussed at several meetings during the coming session.

At all the meetings, many rare and interesting species of insects were exhibited.

G. M. GOLDFINCH, Hon. Sec.

ORNITHOLOGICAL SECTION.

In submitting the annual report of the Section, we have to say that the year has been a satisfactory one. The lecturettes and discussions have been pleasant and informative, and meetings generally have been well attended. A good deal of interesting material accrued from a trip to the Capricorn Islands, Central Queensland, in November, in which several of our members took part. That was the only expedition of a general nature held during the year, but members individually and in small groups have made frequent visits to the Bird Cabin in National Park, some of these visits extending over several days. The Cabin has proved exceedingly useful in this respect, and it will continue to do so. Up to the present we have not attempted any directly systematic work there, but we hope later to achieve something on a larger scale than hitherto, and to publish a general account of the ornithology of National Park, in the interests of the Park, the public, and ourselves. Workers in other branches of natural history have also used the Cabin, notably a University group who have been attempting an ecological survey. This work is now nearly complete.

If company expeditions on the part of the Section have not been carried out to any extent, there have at least been many trips by individual members. Mr. Tom Iredale was at Michaelmas Cay, near Cairns, for a month; Mr. E. F. Pollock visited the Bunker Group of Islands; Mr. Ellis Troughton has gone to the Santa Cruz Group; and Mr. Basset Hull is again visiting New Caledonia. Interesting bird notes should result from each of these trips.

Members of the Section take pride in the fact that they were instrumental in securing for the Australian Museum, last month, the Grant collection of Australian and foreign birds.

The collection in question contains approximately 3,200 skins of birds, about half of them being of Australian origin, and the others representing many countries. Every continent is represented, and also many islands, notably New Guinea, Borneo, Fiji, the Solomons, Timor, the New Hebrides; Samoa; Ceylon; Madagascar; and the Philippines. All the beauty of the rainbow is contained in the plumage of these birds, and there is a strong interest attaching to many of them by reason of their novelty and rarity.

Perhaps the "show" specimens in the collection are the birds of paradise. Nearly twenty species of these brilliant creatures are represented by about forty specimens. The difficulty of securing paradise birds and their increasing rarity are in themselves facts that emphasise the value of the collection.

These bird skins were got together by the late Robert Grant, for many years taxidermist on the staff of the Australian Museum. Mr. Grant was a very able

collector and a skilled taxidermist; he knew what birds to secure and how to look after the skins to the best advantage, and his visits to wild places in the tropics gave him opportunities of securing rare species. He worked on this collection from about 1890 to 1916, so that these birds represent skilled work extending over 26 years.

When Robert Grant died the collection passed into the possession of his son, Henry, who, being also a skilled taxidermist, was able to care for the birds. In time he decided to sell the collection. An offer at once came from South Africa. Then came a bid from the United States, the amount offered being about £750. Mr. Grant was sufficiently patriotic, however, to desire that the collection should remain in Australia. He remembered that Australian students were placed at a disadvantage by the fact that most of John Gould's type specimens of birds were located in Philadelphia, and he did not wish to stress the disadvantage.

It was at this stage that Mr. J. R. Kinghorn, zoologist at the Australian Museum, took up the matter. He organised a small committee from this Section to act with him, and personally communicated with various citizens, pointing out the value of the collection and the wisdom of straining every effort to prevent it leaving Australia. The result was thoroughly gratifying. Five men each gave £100; others gave smaller amounts, and within a few weeks Mr. Kinghorn was able to pay Mr. Grant something over £600 and take over the collection at the Australian Museum.

The rarity of many of the species is emphasised by all naturalists who have seen the list, among them Mr. H. L. White, the well known pastoralist-ornithologist, of "Belltrees," Scone, who was one of the donors. Mr. White is very competent to judge on this point, for he has spent much more money on ornithological collections than anyone else in Australia. Among the Australian birds represented are many familiar species, of course, but there are also such rarities as Prince Albert's lyre bird, the rufous scrub bird, the paradise parrot, the turquoise parrot, the scarlet-chested parrot, the superb parrot, the golden bower bird (a fine series of these beautiful bower birds is included), the black-throated whipbird, and the lilac-crowned wren.

Some of the birds mentioned are believed to be extinct. In any case, there is no chance of Australians generally ever seeing them, save in a collection such as this.

Mention of rare parrots recalls the fact that the position of these birds in Australia is something in the nature of a national calamity. The broad-tailed parrots generally appear to be holding their own fairly well, and certain members of other genera are not in danger. But the sad fact is that several of the *Psephotus* parrots are almost extinct; almost every one of the brilliant *Polytelis* parrots is in grave danger; and practically the whole of the seven members of the *Neophema* genus may disappear in the near future. It should be possible to breed up some of these species in well-kept aviaries, under national supervision, with a view to re-establishing them throughout the country. Meanwhile, the survivors should be rigidly protected, and every effort should be made to check exportation.

Members will have noted that there has recently been a good deal of stirring of dry bones in the trusts that control the destiny of certain show places carrying a natural history interest, in and about Sydney. The trust of the Australian Museum, constituted by an antiquated act, has come in for a good deal of public criticism, and the responsible Minister has declared his intention of having it

remodelled. In that event, it is hoped that the new trust will embrace men who understand museum work, and not include men who chance to be heads of public departments, having no sympathy with museum work. The same thing, broadly, may be said in respect of the National Park and Kuring-gai Chase Trusts. These also have been publicly criticised, largely because many of the trustees, holding life appointments, never attend meetings or pay the slightest heed to the interests of the reservations. The responsible Minister in this case also is considering the matter of re-modelling the Trusts. Perhaps this may lead to the whole question of the conservation of fauna and flora being placed under one department, a thing we advocated some time ago.

NEVILLE CAYLEY, Hon. Secretary.

Office-bearers for the year 1926-27 were elected as follow:—

Chairman, Mr. J. R. Kinghorn.

Vice-Chairman: Mr. H. Wolstenholme.

Hon. Secretary: Mr. N. W. Cayley.

Committee: Dr. E. A. D'Ombrai, Messrs. A. H. Chisholm, C. Coles, and A. Musgrave.

BIRTH OF BLUE-TONGUED LIZARDS.

Lucas and Le Souëf in their "Animals of Australia" (p. 248) write that the Blue-Tongued Lizard, *Tiliqua scincoides*, appears to be oviparous. This is not, however, the case, since internal examination frequently shows large young within the oviducts, and Professor T. T. Flynn has described a placental connection. No observations of the actual process of birth have been recorded, so that the following notes from Mr. Ralph C. Blacket, of Harbord, near Manly, are of interest.

Mr. Blacket's attention was drawn to the matter by Mr. Turner, a bird dealer, who had some living *Tiliquas* in captivity, towards the latter end of February of this year. The animal observed during parturition bore eleven young ones at irregular intervals during a period of about eight hours, from 9 a.m. to 5 p.m. The time intervening between births varied from a few minutes to upwards of half an hour. Mr. Blacket personally saw four of the young lizards born, and gives the following description:—

"When the female lizard was about to give birth, she lifted her hind limbs and the posterior part of the body completely off the ground, upon which the head and forepart of the body was flattened. The young lizard is born folded so that head and tail overlap, and is enclosed in a complete allantoic sac, which is soon burst by its violent wriggings, so that the head emerges. It then takes hold of the foetal membrane in its mouth, and proceeds to devour it, jerking it back off its body a little at a time until the last of it is pulled from the end of the tail. The whole of this process occupies about ten minutes, and the young one then proceeds to explore its surroundings. The young are born separately, each enclosed in its own membranes, and these in every case which I watched formed the first meal. A young one about half an hour after birth ate greedily small pieces of damp bread which were offered to it."

CHECK LIST OF THE AUSTRALIAN TENEBRIONIDAE.

By H. J. CARTER, B.A., F.E.S.

FURTHER CORRIGENDA AND ADDENDA.

A valuable result of the publication of the above is the receipt of information from Herr Gebien, the highest authority on this group. This is summarized below, together with further corrigenda.

- Corrigenda.* p. 120 for *Platagènes* read *Platygènes*.
 p. 130 for *Nyctoperinae* read *Nyctoporinae*.
 p. 134 for *Micrectyche* read *Micrectyche*.
 p. 146 for *convexinsulcus* read *converiusculus*.
 p. 151 for *Encyrtus* read *Eucyrtus*.
 p. 162 for *longicrus* read *longicrurum*.

Omissions. 596a. *Ospidus vestitus* Cart., Linn. Soc. N.S.W., 1919, p. 155. N.T.

727. *Licinoma aenea* Cart. var. *comboyuensis* Cart., l.c., p. 241. N.S.W.

1069a. *Chalcopterus yorkensis* Blkb., l.c., 1892, p. 467. W.A.

Synonymy and extra-Australian distribution.

Ceropria valga Pasc. = *Platydema detersum* Wlk.
 = *P. laticorne* Frm.
 = *P. annamitum* Frm.
 = *P. malaccum* Mars. with a wide Austro-Malayan distribution, Walker's name holds good.

Platydema tricusps Motsch. (India, Java, Papua) is recorded by Gebien from C. York, Australia, taken by Hacker, and must be added to the Australian list.

1. - Vide, pp. 117 and 280 *ante*.

Amarygmus frenchi Blkb. = *A. jodicollis* Guér. from Amboina, Guérin's name has priority.

A. morio F., besides its wide Austro-Malay distribution, has recently been taken by Mr. Lea, in Fiji.

A. regius Cart. = *A. porosus* Blkb., the latter name stands.

Promethis. I stated that this genus had "a doubtful record from India."

P. harmandi Allard (the species to which I referred) is a *Setenis*.

Zopherosis. According to Gebien this genus also occurs in America.

The genera *Edylius*, *Diphyrrhyncus*, and *Heterocheira*, wrongly included under *Nyctoporinae*, should be transferred to the *Opatrinae*.

Tribolium castaneum Herbst. now holds good for No. 136, since *T. ferrugineum* F. does not belong to the TENEBRIONIDAE.

Alphitobius torridus Cart. (No. 171) is a *Pseudoloma*.

This genus of Fairmaire is thus added to the Australian list.

ADDITIONAL FAUNA OF THE COMBOYNE PLATEAU, 1925-1926.

By E. C. CHISHOLM, M.B., Ch.M., R.A.O.U.

In my previous paper, "The Principal Fauna of the Comboyne Plateau,"* I dealt with forms met with during the period, 1923-25. In this paper, which is a continuation, I am dealing with additional forms met with in 1925-26.

INVERTEBRATA.

MOLLUSCA.

Aneitea graeffei. Occasionally met with.

CRUSTACEA.

Talitrus sylvaticus. This is the Amphipod mentioned in my previous paper as occurring under leaves in the brushes. There is an unidentified shrimp in the waters here, but it does not appear to be numerous.

INSECTA COLEOPTERA.

Encara submaculata. Fairly common.

Mastochilus australasicus. Very numerous.

Onthophagus capella. Very plentiful.

Dasygnathus australis. Not as plentiful as the last species.

Pinelopus (porcellus?). Not often seen.

Agrianome spinicollis.

DIPTERA.

Scaptia auriflusa.

Scaptia brevirostris.

Scaptia violacea.

Scaptia montana.

Scaptia quadrimacula.

Scaptia guttata.

Tabanus musgravei. Not very plentiful here.

Tabanus sanguinarius. This species was not taken on the Plateau, but at its base.

Stomoxys calcitrans.

Musca domestica (House Fly), *M. Corvina* (Bush Fly).

Calliphora villosa (Yellow Blowfly), and *Neocalliphora ochracea* (Red Blow fly). Are all common, the lastnamed especially inhabiting the brushes.

Trichophthalma sp. of the family *Nemestrinidae* has a superficial resemblance to the common March fly, but differing in having a pointed tip to abdomen. The wings are pointed, slightly clouded with grey and slightly spread when settled.

Chaetogaster violacea (?). This is probably a color variety of *C. violacea*. It is a large blue metallic tinted fly with yellowish wings.

Gastrophilus equi. Occurs here, but does not seem to be plentiful.

Culicidae. Mosquitoes as a class are not very prevalent and met with mostly in the brushes.

The genus *Anopheles* I have not seen here.

LEPIDOPTERA—RHOPALOCERA.

Nacaduba lineata. In my previous paper I stated that I was not quite certain about seeing this species here. I have since seen and identified it.

* Vol. iv., part ii., November 10th, 1925.

Papilio anactus. I have seen one individual only, which indicates its rarity here.

Eloedina parthia. Rare, and only seen in 1926.

Phaedyra shepherdii. Very rare; only seen once early in November, 1926.

HETEROCERA.

Doratifhora vulnerans. Found here on *Eucalyptus saligna*, in the pupal stage, in early March. Of eleven cocoons I secured, 2 males emerged in the middle of March. This is unusual, as this species emerges usually in November or December. From two others a blue ichneumon fly emerged, showing that the species, in spite of the stinging rosettes of the larva, is not immune to attack.

MYRIOPODA.

Allothoreua maculata.

Cyliosomella sp. A Millipede of the order *Diptopoda*, a broad flattened species found amongst the dead fallen leaves in the brushes which, when disturbed, rolls itself into a ball.

VERTEBRATA.

PISCES.

Anguilla australis. This species differs from *A. reinhardtii* in having the origin of the dorsal fin much further back; otherwise the two species are almost indistinguishable. Both are here in about equal numbers, and it is quite probable that they interbreed. Of one of each species 22 inches long that I caught, I found that in *A. reinhardtii* the distance from the tip of the snout to the origin of the dorsal fin was $7\frac{1}{2}$ inches, while from the same points the distance in *A. australis* was 10 inches—a difference of $2\frac{1}{2}$ inches in the length of the dorsal fin.

AMPHIBIA—ANOURA.

Hyla leseurii. Not very common.

REPTILIA—OPHIDIA.

Python spilotes. In my previous paper I stated that this snake did not occur here. I now have to state that it does occur, but it is not common. The one specimen which I have seen varied considerably from the species as I know it south of Sydney in being more variegated, with patches of greyish white, the diamond-shaped areas being of this color and not yellow, though nearly every scale on back and sides otherwise was black with a yellow centre. It is this latter feature, according to Krefft, which is the distinguishing character between *P. spilotes* and *P. variegatus*. The belly scales in this specimen were straw color, instead of being bright yellow. Krefft gives the range of this species:—"Port Macquarie to Jervis Bay, or perhaps Cape Howe, and from the coast to the western slopes of the Blue Mountains and the Liverpool Range." It is just here that the two species overlap, and one would expect variants at their boundary limits; there is also a great probability that the two species interbreed where their areas overlap. This would help greatly to increase the tendency to variability.

Diemenia psammophis. This does not appear to be very common; found apparently only on the outskirts of the Plateau off the basalt amongst the hardwood timber.

Denisonia signata. This species is found on the basalt, and is fairly common.

LACERTILIA.

Lygosoma (Hinulia) tenue.

Lygosoma (Lirolepisma) mustelinum. Found under logs and stones on the basalt, and fairly common.

Egernia major. This species lives in logs and holes, and is fairly common. It is exceedingly lively, travelling with great rapidity, and is very shy. An individual I procured was dug out from under the roots of a tree growing on basalt.

Physignathus lesueurii. Uncommon. Since writing my previous paper I have seen one or two individuals on the Plateau.

Gymnodactylus (platurus?). A broad tail Gecko. Probably fairly common, though not often seen. It inhabits the hard-wood country at the edge of the Plateau, living under the loose bark of trees.

There is another interesting form of Gecko here, commonly called the "Fan-tail." I have not had the opportunity of seeing one, but from descriptions its tail ends in a fan shape.

Tiliqua nigrolutea. A blue-tongued lizard. Descriptions I have had indicate that this species inhabits the edge of the Plateau, though personally I have not seen it.

AVES.

Synoicus australis. I have seen this species several times, sometimes in pairs, at other times in groups of six to eight. They appear to be fairly numerous, and are seen about open patches of bracken.

Gallinago hardwicki. Seen singly or in pairs about swampy edges of creeks. This is the first year I have seen it here.

Alcyon azurea. This is exceedingly rare on the Plateau. I have only seen one here, though it is plentiful on the streams to which these waters flow.

Micropus pacificus. Some days last summer these birds were numerous for days in succession, though only occasionally seen.

Climacteris erythrops. Uncommon; only seen once.

Plectorhyncha lanceolata. Quite a rare bird here, and I have seen only an occasional individual on the partially cleared brush land.

Carduelis elegans. The English Goldfinch has lately been reported as having been seen here, though I have not yet met with it.

MAMMALIA—MARSUPIALIA.

Isodon macrourus. A rare and very interesting form, a fresh female specimen of which I have forwarded to the Australian Museum. In October, 1925, I was shown a desiccated specimen of an animal by a man who has been used to the bush all his life, and is a native of the North Coast. He admitted that he was puzzled, and asked my opinion as to what the animal was. I was at a loss to answer him straight away. The animal had been dead several months, and was just a dried flattened carcase with only skin and bone left. The skeleton was complete, except for the tail. The feet and claws showed it belonged to the bandicoot family. On examining the dentition I found the cavities on each jaw long and curved, rather suggesting a carnivorous habit. I decided it was something out of the ordinary and sent it to the Australian Museum for identification, and later the whole carcase, along with a fresh foot of the same species caught near the same place in a steel trap, the animal having torn or bitten it off and

escaped. The authorities at the Museum were very much interested in the specimen, and asked me to do my best to get a fresh specimen, as the only skull resembling it that they had was one sent from the Clarence. The fresh foot and that of the carcase were pronounced as being identical. Many people well up in bushlore have been enlisted to enable me to get a fresh specimen since, but without success, until July 25th last, when one was brought to me in a good state of preservation, having been killed by a dog and the entrails removed. The total length of this specimen was 25 inches, head and body 18 inches, tail 7 inches.

A second specimen of this species—a young male—was brought to me on August 23rd last measuring, with head and body, 15 inches. I was able to compare this with a female *I. obesulus* caught the night before, the head and body of which measured 14 inches, and with a specimen of *P. nasuta*, of 11½ inches, which was caught here a little while before and which I had in spirits.

Perameles nasuta. This was mentioned in my previous paper as having been observed here, though up to that time I had not verified it. I am able now to confirm this, as I have seen it myself, though it appears to be less common than *Isodon obesulus*.

Macropus wilcoxi. Red legged wallaby. In my previous paper I mentioned this species. It is invariably called here the "Pademelon." The true Pademelon (*M. thetidis*) does not occur here.

My thanks are due to Dr. Anderson and the Museum staff for the identification of many species, and also to Dr. E. W. Ferguson for the identification of the Diptera, especially the biting flies.

Errata. I would like to call attention to a few misprints in my previous paper: On p. 59, line 15, for *Daphnanandra* read *Daphnandra*; on p. 61, line 11, for "log shelters" read "bag shelters"; p. 61, last line but one, for *Pericea* read *Sericea*; p. 71, line 25, omit "and" at the end of the line; p. 73, line , *Pademelon* should have been in inverted commas, signifying "so-called" *Pademelon*, as it is not the true one; on p. 72, beginning the first line, under *Marsupialia* I have *Perameles obesula*; according to the latest classification and nomenclature this bandicoot is *Isodon obesulus*.

SECTIONAL MEETINGS.

During the period January to June, 1927, meetings of the Sections will be held as follows:—

ENTOMOLOGICAL SECTION:

Wednesday.—9th February.	Wednesday.—11th May.
" 9th March.	" 8th June.
" 13th April.	

ORNITHOLOGICAL SECTION:

Friday.—21st January.	Friday.—15th April.
" 18th February.	" 20th May.
" 18th March.	" 17th June.

MARINE ZOOLOGICAL SECTION.

Monday.—6th February.	Monday.—1st May.
" 6th March.	" 5th June.
" 3rd April.	

Meetings are held at the Society's office, Bull's Chambers, Martin Place, at 7.30 p.m., and are open to all ordinary and associate members.

THE BIOLOGY OF NORTH-WEST ISLET, CAPRICORN GROUP.

(J). CRUSTACEA.

By FRANK A. MCNEILL, Zoologist at the Australian Museum.

(By permission of the Trustees of the Australian Museum.)

(Plate xli.; and Text-figs. 1-2.)

In the last issue of the Australian Zoologist (Vol. iv., 1926, 248) attention was drawn to the fact that the section dealing with the Crustacea collected on North-west Islet by members of the Royal Zoological Society who visited the Capricorn Group in November to December, 1925, was unfortunately omitted from the associated articles treating with the general zoology, etc.

We owe our first knowledge of the Crustacea of the Capricorn Group to the efforts of Grant and McCulloch, who published an account of the Decapoda in 1906 (1). Since that date no systematic list has appeared, and only three references to species occurring in the Group have been published, viz.: *Clibanarius taeniatus* H. M. Edw., recorded for the second time by McCulloch (2) from Masthead Island, and *Chlorodiella niger* Forskål and *Trapezia cymodoce* Herbst, recorded by Rathbun (3) from North-west Islet. It is the purpose of this paper to supplement the work of Grant and McCulloch, but it must be pointed out, however, that in many cases records for the Group appear for the second time, but an effort has been made to amplify the facts already known concerning them. On the other hand, quite a number of species are recorded for the first time, some of which constitute new records for the Queensland coast and Australia.

The islands of the Capricorn Group are reef-girt like many of similar construction along the coast of Queensland. They are termed pseudo-atolls, and their general geography has been well treated by Hedley (4), Grant and McCulloch (*loc. cit.*, 1906) and Musgrave (5).

My thanks are due to Dr. Mary J. Rathbun and Dr. Waldo Schmitt, of the U.S. Nat. Museum., and H. M. Hale, of the South Australian Museum, for assistance in the determination of a few of the more obscure species of the Decapoda. The latter gentleman, Mr. W. H. Baker, of Adelaide, South Australia, and Dr. Chas. Chilton, of Christchurch, New Zealand, have determined the few species of Isopoda obtained by the expedition.

In dealing with the various species of the collection, original references are quoted, together with others selected for their value as aids in the determination of individual species.

It was mainly due to the enthusiasm of the late Miss E. Chase, B.Sc., Demonstrator in Zoology, University of Sydney, and Mr. G. P. Whitley, of the Australian Museum, that such a fine collection was secured.

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- (1). Proc. Linn. Soc. N.S. Wales, xxxi. 1906, 2.
 - (2). Rec. Austr. Mus. ix., 1913, 349, pl. xi., fig. 1.
 - (3). Biol. Res. F.I.S. "Endeavour," v., 1923, 108 and 129.
 - (4). Proc. Linn. Soc. N.S. Wales, xxxi., 1906, 453.
 - (5). Australian Zoologist, iv., 1926, 199-209, pls. xxv.-xxix.

Class CRUSTACEA.
 Subclass MALACOSTRACA.
 Order DECAPODA.
 Suborder NATANTIA.
 Tribe CARIDES.
 Family PONTONIIDAE.
 Genus PERICLIMENES Costa.
 Subgenus ANCYLOCARIS Schenkel.

PERICLIMENES (ANCYLOCARIS) SPINIFERUS.

Periclimenes petithouarsi, var. *spinifera*, de Man, Abhandl. Senck. Naturf. Ges., xxv., 1902, 824 (Amboina and Ternate).

Periclimenes (Ancylocaris) spiniferus Kemp, Records Indian Mus., xxiv., ii., 1922, 195 (and synonymy).

With some little hesitation I refer to this species an ovigerous female specimen 16.5 mm. long, which has the second legs missing. The chela of the first leg is as shown in Borradaile's figure (6), but it is only half as long as the carpus, whereas Borradaile (7) shows it as being about two-thirds as long as the carpus.

No previous record of the occurrence of the species in Australian waters appears to have been published.

Locality.—In pool on reef, North-west Islet, Capricorn Group, Queensland.

PERICLIMENES (ANCYLOCARIS) ELEGANS var. DUBIUS.

Periclimenes (Falciger) dubius Borradaile, Ann. Mag. Nat. Hist. (8), xv., 1915, 211.

Periclimenes (Ancylocaris) elegans Paulson, var. *dubius* Kemp, Records Indian Mus., xxiv., ii., 1922, 218.

A male specimen of this small species of shrimp was collected in a pool on the reef. It measures 7.5 mm. from the tip of the rostrum to the end of the carapace and agrees perfectly with Kemp's description and figure.

Another male specimen of the species measuring 9.5 mm. in length is from the same source, but has the second legs missing and can only doubtfully be referred to the variety *dubius* as above.

The present record constitutes an addition to the Australian coastal fauna.

Locality.—North-west Islet, Capricorn Group, Queensland.

Genus PONTONIA Latreille.

PONTONIA TRIDACNAE.

Conchodytes tridacnae Peters, Mon. Ber. Acad. Wiss. Berlin, 1852, 594 (Ibo, East Africa).

Pontonia (Conchodytes) tridacnae Miers, Zool. H.M.S. "Alert," 1884, 290.

Pontonia tridacnae Ortmann, Zool. Jahrb., Syst., v., 1890, 509. *Idem*, Henderson Trans. Linn. Soc. London, Zool. (2), v., 1893, 438.

An unique ovigerous female specimen about 19 mm. long is identified as this species. It agrees very well with Dana's figure (referred to by Miers, *loc. cit.*) in that the chelae are similar in form and proportion; this character was commented upon by Miers.

(6) Trans. Linn. Soc. London, xvii., 2nd ser. Zool., 1917, pl. lii., f. 1k.

(7) *Loc. cit.*, f. 1a.

Unfortunately no data are obtainable concerning the host of the specimen which appears to have been captured swimming freely in a pool on the reef. Exhaustive inquiries failed to elicit further details from the collectors, and in view of the fact that Mier's specimens also were not associated with any host, it would appear that the species is not as sedentary a commensal as some of its allies.

Locality.—North-west Islet, Capricorn Group, Queensland.

Family HIPPOLYTIDAE.

Genus SPIRINTOCARIS Spence Bate.

SPIRINTOCARIS MARMORATA.

Palaeon marmoratus Olivier, Encycl. Méth. Hist. Nat., Insectes, viii., 1811, 665; atlas, xxiv., 1818, pl. 319, fig. 3.

Hippolyte gibberosus Haswell, Cat. Austr. Crust., 1882, 185. *Idem*, Whitelegge, Australian Museum Memoir, iii., 2, 1897, 146.

Hippolyte gibberosa Ortmann, Zool. Jahrb., Syst., v., 1890, 497.

Hippolyte marmorata Ortmann, *Tom. cit.*, 497, pl. xxxvi., fig. 18.

Spirintocaris marmorata Rathbun, Bull. U.S. Fish. Comm., xxiii., 3, 1903 (1906), 913 (synonymy).

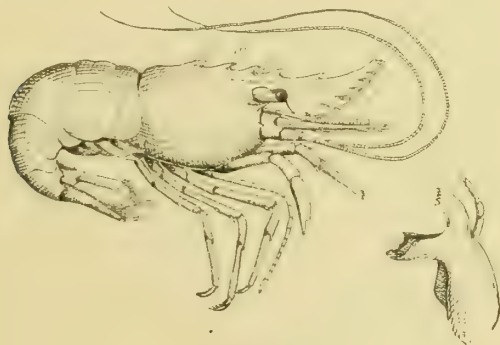


Fig. 1. *Spirintocaris marmorata*.

Side view (slightly enlarged) and mandible (enlarged), from a pen drawing by the late F. E. Grant. The original was presumably from Masthead Island, in the Capricorn Group, Queensland, where the artist made an extensive collection.

Two males (measuring 16.5 and 21 mm. from the tip of the rostrum to the end of the carapace) and two ovigerous females (19 and 20 mm. long) of this typical reef shrimp were secured in pools on the reef at North-west Islet. Another ovigerous female example (19 mm. long) was collected under similar circumstances on Wilson Islet, during a day's excursion from the main base.

The present record appears to be the first definite one for the species in Australian waters.

The sketch of the species reproduced here is from the pen of the late F. E. Grant and dated 1905. It shows all the main characteristics of the form and will facilitate identification.

Locality.—Capricorn Group, Queensland.

Family CRANGONIDAE [= ALPHEIDAE *olim*].

Genus CRANGON [= ALPHEUS *olim*] Weber.

CRANGON [= ALPHEUS *olim*] EDWARDSII.

Athanasus edwardsii Audouin, Explic. Planches de Savigny, Description de l'Egypte, Atlas, 1809, pl. x., fig. 2.

Crangon edwardsii Rathbun, Proc. Zool. Soc. London, 1914, 3, 654 (and synonymy quoted).

Three ovigerous females 9 to 16 mm. long, measured from the tip of the rostrum to the end of the carapace. Secured under loose dead coral blocks on the reef, where they were common.

This species has a wide range along the eastern Australian coast line.

Locality.—North-west Islet, Capricorn Group, Queensland.

Tribe STENOPIDEA.

Family STENOPIDEA.

Genus STENOPUS Latreille.

STENOPUS ROBUSTUS.

Stenopus robustus Borradaile, Trans. Linn. Soc. London, xiii., ii., 2nd ser. Zoology, 1910, 260, pl. 16, fig. 4.

One juvenile example with limbs missing measures 6 mm. from the tip of the rostrum to the end of the carapace. Another damaged specimen secured with the above is about the same size, and is now in the United States National Museum collection. Both specimens were kindly identified for me by Dr. Waldo Schmitt, of the abovenamed Institution. They are undoubtedly correctly referred to *S. robustus*, as the identification was helped out by a further complete specimen of the species (8.5 mm. as above) from Port Jackson, which was examined in conjunction with the damaged material.

It appears that the above records represent the first mention of the species from Australian waters; the type locality is Chagos Archipelago, and I know of no further reference to the species in literature.

The species is obviously a tropical one and the New South Wales record is most interesting, as proving the existence of the strong south flowing current (Notonectian) which brings the larvae of several Decapod wanderers to these shores.

Locality.—Reef, North-west Islet, Capricorn Group, Queensland.

Suborder REPTANTIA.

Tribe PALINURA.

Family PALINURIDAE.

Genus PALINURUS Fabricius.

PALINURUS VERSICOLOR.

Palinurus versicolor Latreille, Annal. du Mus. d'Hist. Nat. Paris, 3, 1804, 394.

de Man, Abh. Senck. Naturf. Ges., xxv., 3, 1902, 760 (and synonymy).

One large male 13½ inches long, including telson, was speared in the shallow water of the lagoon.

The very striking colour-marking of this form makes it at once recognisable as the species recorded and figured by de Haan (in Siebold's Fauna Japonica, Crust., v., 1841, 159, pls. xliii. and xliv., fig. 2) under the name "*Palinurus fasciatus* Fabr.," which is included as a synonym of *P. versicolor* by de Man in the work quoted above. The absence of a complete set of literature prevents me

from checking the identity further, but if the nomenclature has undergone any changes since de Man's paper was written I can be certain that the species here recorded will be easily recognised.

In the "Narrative of North-west Islet," Mr. A. Musgrave discusses the capture of the above specimen under the name *P. fasciatus*, supplementing his remarks by a fine photograph (Australian Zoologist, iv., 1926, 205, pl. xxvii., fig. 3).

The species has apparently not been recorded before from Australian waters. In the collection of the Australian Museum there are other much smaller specimens from Murray Island, Torres Strait: Malo, New Hebrides: Furona Id., S.W. coast of Ysabel, British Solomons.

Locality.—North-west Islet, Capricorn Group, Queensland.

Tribe ANOMURA.

Family PAGURIDAE.

Genus DARDANUS Paulson.

DARDANUS DEFORMIS.

Pagurus deformis H. M. Edw., Ann. Sci. Nat. (2), vi., 1836, 272, pl. xiii., fig. 4. *Idem*, Henderson, "Challenger," Zool., xxvii., 1888, Anomura, 57 (and references).

The two examples of this well known species in the collection have their genital apertures at the base of the third legs (8); the major hands measure eight by fourteen mm. and eighteen by twenty-six mm.

Miers in 1880 (9) expressed some doubt as to the distinctness of *D. pedunculatus* Herbst (10) and the present species of H. M. Edwards. It is difficult to recognise any likeness between the figures supplied by these authors, but Rathbun (11) has associated them under the former name. I have not seen any published reasons for this action, and, not having been able to come to a decision myself, have refrained from using Herbst's name in the present instance.

Locality.—Reef, North-west Islet, Capricorn Group, Queensland.

DARDANUS MEGISTOS.

Cancer megistos Herbst, Naturg. d. Krabben u. Krebse, iii., 4, 1804, 23, pl. 61, fig. 1.

Pagurus megistos Stebbing, Crust. South Africa, iv., 1908, 21 (and synonymy).

Pagurus punctulatus Grant and McCulloch, Proc. Linn. Soc. N.S. Wales, xxxi., 1906, 37.

This widely distributed and strikingly coloured Indo-Pacific species is represented by one male and four females; the length of the major hand ranges from 14.5 to 50 mm. The largest specimen is a female, the hand measurement of which exceeds that of the next in size (a male) by 23 mm. In an account of North-west Islet, which appeared in last issue of the Australian Zoologist, Musgrave refers to the above species and illustrates his remarks by a photograph (12).

Locality.—Reef, North-west Islet, Capricorn Group, Queensland.

(8). See Borradaile P.Z.S. Lond., 1898, iii., 460.

(9). Ann. Mag., Nat. Hist. (5), v., 1880, 374.

(10). Naturg. d. Krabben u. Krebse, iii. 4, 1804, 25, pl. 61, fig. 2.

(11). Smith. Misc. Coll., xlix., No. 1717, 1907, 204.

(12). Australian Zoologist, iv., 1926, 205, pl. xxvii. fig. 4.

Genus *CALCINUS* Dana.*CALCINUS LATENS*.

Calcinus latens Randall, Journ. Acad. Nat. Sci. Philad., 1839, p. 135 (fide Dana 1852, and Stimpson 1907). Grant and McCulloch, Proc. Linn. Soc. N.S. Wales, xxxi., 1906, 34 (and synonymy). Stimpson, Smith. Misc. Colls., xlix., No. 1717, 1907, 208.

One male and one ovigerous female approximately 25 and 30 mm. in length
Locality.—Reef, North-west Islet, Capricorn Group, Queensland.

Family AXIIDAE.

Genus *AXIUS* Leach.Subgenus *NEAXIUS* Borradaile.*AXIUS* (*NEAXIUS*) *PLECTORRHYNCHUS*.

Axius plectorhynchus Strahl, Monatsberichte der kön. preuss. Akad. der Wissenschaften, Berlin, 1861 (1862), 1060, and figs. 2-4 and 11 on plate opposite p. 1072; and Ann. Mag. Nat. Hist., 3rd ser., ix., 1862, 387. Miers, Zoology H.M.S. "Alert," 1884, 282. Fulton and Grant, Proc. Roy. Soc. Victoria, xiv. (n. ser.), 1902, 60, pl. v., fig. 7-8.

Axius (*Neaxius*) *plectorhynchus* de Man, "Siboga" Expd., Monogr. xxxix. a⁵, Decapoda, pt. vi.—Axiidae, 1925, 12-13.

One small female, measuring 6 mm. from the tip of the rostrum to the end of the carapace, agrees perfectly with Strahl's description and figures. It was kindly identified for me by Dr. Waldo Schmitt.

Miers was the first to record this species from the Queensland coast when he somewhat hesitatingly described an incomplete specimen about 1½ inches long secured at Port Molle during the "Alert" Expedition. The present record verifies the occurrence of the species in Queensland, but Miers' timidity is to be admired, seeing that his specimen lacked chelae (fide notes made by the late F. E. Grant on the specimen in the British Museum) and was discovered at a locality greatly removed from Luzon in the Philippines (the type locality of *A. (N.) plectorhynchus*); a comparison of Miers' description and the abovementioned notes by Grant with Strahl's description and figures satisfies me that the Port Molle specimen is correctly identified.

Since Miers' record of the species, Fulton and Grant have recognised it from Victoria, and there are several specimens in the Australian Museum from South Australia.

Variation.—In a species having such a huge range as *A. (N.) plectorhynchus* one must expect a certain amount of variation, as exemplified in the Soldier Crab (*Mictyris longicarpus*) recently dealt with by me in the Records of the Australian Museum. Fulton and Grant have already referred to the variable number of rostral teeth on the series examined by them and this feature is particularly noticeable in the southern Australian specimens before me, some of which are two inches long. Strahl's figure shows a disposition of the rostral spines which allows of a bifurcate rostral extremity, thus agreeing with the small specimen I have from Queensland, and apparently also with Miers' specimen from Port Molle which is said to have five or six teeth on *each side* of the rostrum. In the southern Australian specimens, however, the rostrum may have a well defined median tooth, or three of equal length at the extremity which gives the structure a trienspid appearance; Fulton and Grant figured the former condition of the rostrum, and made no comment about the bifurcate extremity as depicted by

Strahl for the reason that they obviously overlooked that author's figures. In some small southern Australian examples, also, the rostrum is much more flattened and not markedly hollowed or concave above as in Strahl's figure, or the small Queensland specimen before me. All major characters are consistent, however, and it would be impossible to my mind to separate the species into varieties, as the variation noted above may occur in any one series of the species from southern Australian waters, a fact already recorded by Fulton and Grant.

Locality.—Reef, North-west Islet, Capricorn Group, Queensland.

Family CALIGANASSIDAE.

Genus UPOGEBIA Leach.

UPOGEBIA SIMSONI.

Gebia simsoni Thomson, Proc. Roy. Soc. Tasmania, 1892, 49, pl. i., figs. 3-5.

Upogebia simsoni Fulton and Grant, Proc. Roy. Soc. Vic., xiv. (n. ser.), 1902, 61, pl. v., figs. 5-6.

One female specimen measuring 5.5 mm. from the tip of the rostrum to the end of the carapace was identified for me by Dr. Waldo Schmitt, of the United States National Museum, who states (*in lit.*): "This specimen seems to upset Borradaile's subgeneric revision of *Upogebia* (Ann. Mag. Nat. Hist., 7th ser., xii., 1903, p. 542), for though the 'thumb' is distinctly shorter than the movable finger I can find no trace of the 'small sharp tooth on the fore edge of the carapace over the antenna.' Moreover, 'the two branches of the last limb' though 'broad and stout,' are longer than the telson, which is not admitted in the generic definition of *Upogebia* as it stands at present."

The species appears to have been only previously recognised from the east coast of Tasmania (Thomson—type locality) and Flinders, Western Port, Victoria (Fulton and Grant). The present record is a notable extension to the range of the species, and an addition to the Decapod fauna of Queensland.

Locality.—Reef, North-west Islet, Capricorn Group, Queensland.

Family GALATHEIDAE.

Genus GALATHEA Fabricius.

GALATHEA PUSILLA.

Galathea pusilla Henderson, Ann. Mag. Nat. Hist. (5), xvi., 1885, p. 407.

Grant and McCulloch, Proc. Linn. Soc. N.S. Wales, xxxi., 1906, 43 and 49, pl. iv., figs. 5, 5a (with references).

One example measuring 11 mm. from the tip of the rostrum to the end of the telson is definitely identified as this species. Although the chelae and most of the legs are missing from the specimen, it is easily identified with the aid of Grant and McCulloch's key, which provides characters for the rostrum and the outer maxillipedes only.

Locality.—North-west Islet, Capricorn Group, Queensland; from pool on reef.

Family PORCELLANIDAE.

Genus PETROLISTHES Stimpson.

PETROLISTHES LAMARCKI.

Pisidia lamarckii Leach, Diet. Sci. Nat., xviii., 1820, 54.

Petrolisthes lamarcki Grant and McCulloch, Proc. Linn. Soc. N.S. Wales, xxxi., 1906, 38.

Two males and one ovigerous female (7 to 8 mm. across the carapace) from North-west Islet, and one male (8 mm. across the carapace) from Wilson Islet. All the specimens were collected under dead coral blocks on the respective reefs.

Locality.—Capricorn Group, Queensland.

Tribe BRACHYURA.
Subtribe OXYSTOMATA.
Family CALAPPIDAE.
Genus CALAPPA Fabricius.
CALAPPA HEPATICA.

Cancer hepaticus Linnaeus, Syst. Nat., ed. xii., vol. i., pt. ii., 1767, p. 1048.

Calappa hepatica Grant and McCulloch, Proc. Linn. Soc. N.S. Wales, xxxi., 1906, 24.

Three adult males 66 to 80.5 mm. wide were collected on a sandy bottom in the reef shallows.

This species is very common on the Queensland coast, and the following observations on its habits were made by the late Allan R. McCulloch:—"Occurs everywhere in sandy flats into which it burrows rapidly, rising the legs to push away the sand so that it seems to sink into it backwards almost without effort. Meantime the chelipeds are held in a defensive attitude until nearly covered, when they are drawn up against the body as the crab disappears from view. The creature is merely covered, however, and a slight disturbance will hunt it out to repeat the manoeuvre a few yards away."

Locality.—North-west Islet, Capricorn Group, Queensland.

Subtribe BRACHYGNATHA.
Superfamily OXYRHYNCHA.
Family MAJIDAE.
Subfamily ACANTHONYCHINAE.
Genus MENAETHIUS H. M. Edwards.
MENAETHIUS MONOCEROS.

Pisa monoceros Latreille, Encyclop. Methodique, x., 1825, 139.

Menaethius monoceros Calman, Trans. Linn. Soc. London, viii., 2nd ser., Zool., 1900, 34. *Idem*, Grant and McCulloch, Proc. Linn. Soc. N.S. Wales, xxxi., 1906, 32. *Idem*, Balss, Archiv für Naturg. 90, Abt. A., 5 heft, 1924, 27 (with references).

A series of five specimens (7 to 13.5 mm. wide) of this typical coral reef species was secured; this includes one adult of both sexes and three juvenile males.

Locality.—Reef at North-west Islet, Capricorn Group, Queensland.

Subfamily MAJINAE.
Genus TIARINIA Dana.
TIARINIA GRACILIS.

Tiarinia gracilis Dana, U.S. Explor. Exped., Crust. 1, 1852, 111, pl. 3, figs. 6a-d.

Idem, de Man, Abh. Senck. Naturf. Ges., xxv., 3, 1902, 674.

? *Tiarinia depressa* Stimpson, Smith. Misc. Coll., xlix., No. 1717, 1907, 12, pl. iii., fig. 2.

One ovigerous female with carapace 11 mm. long (including rostrum) and 7.5 mm. wide.

The specimen has been submitted to Dr. Rathbun, who considers it to be referable to the above species, although she states (*in lit.*) that "the tubercles are much less strong than usual." Dr. Rathbun also suggests that *T. depressa* Stimpson is a synonym of *T. gracilis* Dana, a statement I am inclined to accept. Unfortunately, however, there is no possibility of examining Stimpson's type material, as it was destroyed by fire in 1871 (see *loc. cit.*, 1907, 3) and any conclusions, therefore, must be based solely on his description and figure.

Superfamily BRACHYRHYNCHA.

Family PORTUNIDAE.

Genus THALAMITA Latreille.

THALAMITA ADMETE.

Cancer admete Herbst, Natur. d. Krabben u. Krebse, 3, pt. 3, 1803, 40, pl. 57, fig. 1.

Thalamita admete Rathbun, Mem. Mus. Comp. Zool., xxxv., No. 2, 1907, 63 (and references).

In all, three specimens of this species were collected—two females measuring 13 and 16.5 mm. across the carapace and one male measuring 31 mm.

Locality.—Reef, North-west Islet, Capricorn Group, Queensland.

THALAMITA STIMPSONI.

Thalamita stimpsoni A. M. Edwards, Arch. Mus. Paris, x., 1861, 362, 367, pl. xxxv., fig. 4. Alcock, Journ. Asiat. Soc. Bengal (n. ser.), lxxviii., 2, No. 1, 1899, 73, 79 (with references).

Two adult female examples with carapaces 45 and 52.5 mm. wide.

Locality.—Reef, North-west Islet, Capricorn Group, Queensland.

Genus CAPHYRA Guérin.

CAPHYRA LAEVIS.

Caphyra laevis A. M. Edwards, Nouv. Arch. Mus. Paris, ix., 1873, 173, pl. iv., fig. 2. Grant and McCulloch, Proc. Linn. Soc. N.S. Wales, xxxi., 1906, 18.

Two ovigerous females, 16 mm. wide.

Though hitherto considered to be rare, this species apparently may be obtained fairly plentifully by combing one's fingers gently through the polyps of colonies of the Aleyonarian coral *Xenia*. With a pale bluish white carapace and legs marked longitudinally with darker bands to resemble its host, this little crab lives secure from its enemies, protected by the armed tentacles of the *Xenia*, and doubtless securing a plentiful supply of food in the way of small worms, etc., paralyzed by the stinging cells of its host.

This curious commensalism obviously explains the modification of the dactyls of the swimming legs for anchorage purposes.

Locality.—In a pool on the reef, North-west Islet, Capricorn Group, Queensland.

CAPHYRA ROTUNDIFRONS.

Camtonyx rotundifrons A. M. Edwards, Nouv. Arch. Mus. Paris, v., 1869, 156, pl. vii., figs. 11-12.

Caphyra rotundifrons Calman, Trans. Linn. Soc. London, viii., 2nd ser., Zool., 1900, 20.

One female example measuring 9 mm. across the carapace.

This species was originally described from New Caledonia and it has been recorded from "Torres Straits" by Calman (*loc. cit.*), but the present record ap-

pears to be the first definite one of its occurrence on the Australian coast. It is no doubt a commensal like the previous species, but unfortunately no information is available concerning its habits.

Locality.—Reef, North-west Islet, Capricorn Group, Queensland.

Family XANTHIDAE.

Genus PILUMNUS Leach.

PILUMNUS SPINICARPUS.

Pilumnus hirsutus Haswell, Cat. Austr. Crust., 1882, 69 (not *P. hirsutus* of Stimpson).

Pilumnus spinicarpus Grant and McCulloch, Proc. Linn. Soc. N.S. Wales, **xxxi.**, 1906, 15, pl. i., fig. 2, 2a (and synonymy). *Idem*, Rathbun, Biol. Res. "Endeavour," v., 3, 1923, 123.

One ovigerous female example measuring 15 mm. across the widest part of the carapace (including spines).

Synonymy.—Several recent acquisitions at the Australian Museum have been recognised as Haswell's *P. hirsutus*, but it was realised that his description did not fit either Stimpson's or Rathbun's (13) remarks, nor specimens in the Australian Museum, correctly identified by the latter author from the collections made by the F.I.S. "Endeavour." Unfortunately, the specimens on which Haswell based his record of *P. hirsutus* cannot be traced, and the opportunity to decisively solve the problem is lost. There can be no doubt, however, that Haswell's record was based on examples of Grant and McCulloch's *P. spinicarpus*, probably of larger size than the type material. The fact that Haswell records the presence of three to four spines on the merus of the legs is sufficient evidence alone to associate his description with *P. spinicarpus*, and the presence in the Australian Museum collection of a specimen of *P. spinicarpus* from the same locality (Holbourne Island, Queensland) as Haswell's record of "*P. hirsutus*" strengthens this belief; numerous specimens of *P. spinicarpus* are in the Australian Museum from many Queensland localities, thus indicating that it is a reef species of rather common occurrence.

Grant and McCulloch have already associated Haswell's *P. cursor* with their *P. spinicarpus*, an action with which I am in perfect accord after an examination of Haswell's specimens from Port Molle, Queensland.

Whitelegge's mention of *P. cursor* in 1897 (14) was based on Haswell's *P. cursor* (nec. A. M. Edwards).

It seems surprising that Haswell should have identified as separate species two batches of the same form. The only way to account for this is that his *P. hirsutus* material was larger in size than his specimens of *P. cursor*; he was evidently deceived by the growth variation that is noticeable on the examination of any large series of *P. spinicarpus*. Haswell was responsible for many anomalies in his work in the Catalogue of Australian Crustacea, but we must remember that he was the pioneer of systematic Australian Carcinology, and not judge him too harshly on what in his day was a monumental work.

Variation.—In large specimens of *P. spinicarpus* (there is one male before me 22 mm. wide) the frontal lobes are a little more produced and strongly serrated, a small area of the carapace behind the antero-lateral spines is clearly granular and the marginal spines are very well developed, particularly one at

(13). For references see Rathbun, Biol. Res. F.I.S. "Endeavour," v. 3, 1923, 122, pl. xxviii.

(14). Whitelegge, Austr. Mus. Mem., iii., 2, 1897, 136.

the outer angle of each orbit and the one immediately below it on each antero-lateral margin. Also, the spines of the sub-orbital margins are very distinct; at the inner angle of each orbit there may also be present a small well developed spine, and in the largest specimen examined the spines are more numerous on the merus of the legs than described by Grant and McCulloch. The foregoing characters are not noticeable on many other smaller specimens, including the types which are quite obviously undeveloped examples of the species. Haswell noted that he recognised what he considered a variety of his *P. hirsutus* (nec Stimpson) which had the tubercles of the hands less numerous and less prominent. This character is noticeable in several examples before me from Port Denison, but it is in a male specimen from Port Darwin that the variation reaches its most advanced stage. This example cannot be separated from *P. spinicarpus* in major characters, but the carpus of each cheliped is covered with only very small widely separated tubercles above, and the larger hand is quite smooth, except where three to four minute tubercles occur. Above, at its articulation with the carpus, the smaller hand is sparsely granular, being quite smooth elsewhere. Such deviation from the typical form is not unknown among other eastern Queensland Decapods whose range extends northward around the Australian coast, and I refrain from giving the above variety a name until it is possible to examine a much larger series of the species from the intermediate localities of its range.

There are specimens in the Australian Museum from—Off Pine Peak, Queensland (dredged), and N.N.E. of Bowen, Queensland, 16 fathoms—F.I.S. "Endeavour"; Masthead Island, Capricorn Group, Queensland (type locality); Port Molle, Queensland (*P. cursor* Haswell, nec. A. M. Edwards); Cairns Reef, off Cooktown, Queensland; Port Denison, Queensland; Holbourne Island, Queensland (same loc. as *P. hirsutus* Haswell, nec. Stimpson); Hayman Island, Whitsunday Group, Queensland; Port Darwin, North Australia (variety).

Locality.—Reef at North-west Islet, Capricorn Group, Queensland.

Genus CHLORODOPSIS A. M. Edwards.

CHLORODOPSIS PILUMNOIDES.

Chlorodius pilumnoides Adams and White, Zool. H.M.S. "Samarang," Crust., pt. 2, 1849, 41, pl. ix., fig. 3.

Chlorodopsis pilumnoides Rathbun, Biol. Res. F.I.S. "Endeavour," v., 3, 1922, 108.

Two male examples 12 to 12.5 mm. wide are clearly identical with this species; they agree well with Adams and White's description and figure.

Only one previous record of the species from the Queensland coast appears to have been published—that of Dr. Mary J. Rathbun (*loc. cit.*). This was based on a very small example (5.3 mm. wide) from off Cape Capricorn, Queensland, in thirteen fathoms. The present identification of an adult verifies the occurrence of the species.

Locality.—Reef, North-west Islet, Capricorn Group, Queensland.

Genus ERIPHIA Latreille.

ERIPHIA SEBANA.

Cancer sebanus Shaw, in Shaw and Nodder, Nat. Misc., xv., 1803, pl. 591.

Eriphia laevimana Grant and McCulloch, Proc. Linn. Soc. N.S.W., xxxi., 1906, 14.

Eriphia sebanus Rathbun, Mem. Mus. Comp. Zool., xxxv., 2, 1907, 57.

Six specimens (2 males and 4 females) measuring 47 to 56 mm. across the carapace.

This is a very common species on the reefs of the Queensland coast.
Locality.—North-west Islet, Capricorn Group, Queensland.

Genus ETISUS H. M. Edwards.
 ETISUS LAEVIMANUS.

Etisus laevimanus Randall, Journ. Acad. Nat. Sci. Philad., viii., 1839, p. 115.
Idem, Miers, Zool. "Alert," 1884, 217. *Idem*, Alcock, Journ. Asiat. Soc. Bengal (n. ser.), lxvii., pt. 2, No. 1, 1898, 129, 131 (and synonymy). *Idem*, Calman, Trans. Linn. Soc. London, viii., 2nd ser., Zool., 1900, 7.
 One male 64 mm. across the widest part of the carapace.
 This is a widely distributed and common reef crab of the Queensland coast.
Locality.—North-west Islet, Capricorn Group, Queensland.

Genus ETISODES Dana.
 ETISODES ELECTRA.

Cancer electra Herbst. Naturg. d. Krabben u. Krebse, 3, ii., 1801, 34, pl. li., fig. 6
Etisodes electra Alcock, Journ. Asiat. Soc. Bengal (n. ser.), lxvii., 2, No. 1, 1898, 133 (and synonymy). *Idem*, Rathbun, Bull. U.S. Fish. Comm., xxiii., for 1903, pt. iii., 1906, 851, pl. ix., fig. 7. *Idem*, Grant and McCulloch, Proc. Linn. Soc. N.S. Wales, xxxi., 1906, 10.
 One male and one female measuring respectively 10.5 and 15.5 mm. across the widest part of the carapace. This species is not uncommon on the reefs of the Queensland coast.

Locality.—North-west Islet, Capricorn Group, Queensland.

Genus CHLORODIELLA Rathbun.
 CHLORODIELLA NIGER.

Cancer niger Forskal, Descr. Anim., 1775, p. 89.
Chlorodius niger Alcock, Journ. Asiat. Soc. Bengal (n. ser.), lxvii., 2, No. 1, 1898, 160. *Idem*, Grant and McCulloch, Proc. Linn. Soc. N.S. Wales, xxxi., 1906, 12.

Chlorodiella niger Rathbun, Bull. U.S. Fish. Comm., xxiii., for 1903, pt. iii., 1906, 857. *Idem*, Rathbun, Biol. Res. F.I.S. "Endeavour," v., 3, 1923, 108.

Four males—two adults measuring 13 and 19 mm. across the carapace, one young male measuring 11 mm., and one juvenile 5 mm. There are very definite spines on the antero-lateral margins of the young in this species, but as growth proceeds these degenerate into lobes which may be very obtuse.

An exceptionally common species on the Queensland coast.

Locality.—Reef, North-west Islet, Capricorn Group, Queensland.

CHLORODIELLA LAEVISSIMA.

Chlorodius laevisimus Dana, Proc. Acad. Nat. Sci. Philad., 1852, 80; and U.S. Expl. Expd., Crust. 1, 1852, 215, pl. xii., fig. 4a-g. *Idem*, Grant and McCulloch, Proc. Linn. Soc. N.S. Wales, xxxi., 1906, 12.

Chlorodiella laevisissima Rathbun, Bull. U.S. Fish. Comm., xxiii., for 1903, pt. iii., 1906, 857.

Five specimens (two males and three females) range from 6 to 8.5 mm. across the carapace, and are exactly similar to those in the Australian Museum recorded under the same name from Masthead Island in the Capricorn Group by Grant and McCulloch.

The examples are somewhat hesitatingly referred here, however, for the above authors have noted that their specimens differ a little from *C. laevis* as originally described by Dana from the Hawaiian Islands in being sparingly areolate and having a noticeable tuft of felted hairs at the base of the fingers of the major chelipeds. The Queensland specimens in the Australian Museum collection which are identified as *C. laevis* are easily distinguishable from the allied *C. niger* of Forskal, but this is apparently not so with the form Rathbun examined and determined as Dana's *C. laevis* from the Hawaiian Islands (type locality). Rathbun states that "The line is not sharply drawn between" the two species occurring in these islands and they can only be separated on the following characters—"C. laevis has an orange reddish colour, while *C. niger* is brownish. Adult *C. niger* has the carapace finely granulate under the lens. Adult *C. laevis* has the central part of the dorsum smooth; young specimens of both are much smoother." Rathbun discredits the value of the arching of the fingers as a distinguishing character, thus opposing the views expressed by Dana and Alcock. Several of the specimens before me have been stored since capture in a medium of glycerine and water and exhibit the orange reddish colour noted by Rathbun. Each ambulatory limb, however, has in addition one or two transverse rows of reddish spots which are consistent in all of the Queensland specimens examined by me, both the present series and previous batches from other localities. All have the central part of the dorsum smooth; the anterior part is finely granular under the lens, this character being no doubt the one which inspired Grant and McCulloch's remark—"the carapace is sparingly areolate."

Locality.—Reef, North-west Islet, Capricorn Group, Queensland.

Genus PLATYPODIA Bell.

PLATYPODIA ANAGLYPTA.

Atergatis anaglyptus Heller, Abhandl. zool.-bot. Gesell. Wien, 1861, 6; and S.B. Ak. Wien, xliii., 312, pl. ii. figs. 11-12.

Lophactaea anaglypta Grant and McCulloch, Proc. Linn. Soc. N.S. Wales, xxxi., 1906, 9.

Platypodia anaglypta Rathbun, Mem. Mus. Comp. Zool., xxxv., No. 2, 1907, 38.

One juvenile female and one half-grown male measuring 9 and 13 mm. across the carapace. Not uncommon on several islands off the Queensland coast.

Locality.—Reef, North-west Islet, Capricorn Group, Queensland.

Genus PHYMIDIUS A. M. Edwards.

PHYMIDIUS UNGULATUS.

Chlorodius unguatus H. M. Edwards, Hist. Nat. Crust., i., 1834, 400, pl. 16, figs. 6-8.

Phymodius unguatus Alcock, Journ. Asiat. Soc. Bengal (n. ser.), lxvii., pt. 2, No. 1, 1898, 162. *Idem*, Calman, Trans. Linn. Soc. London, viii., 1, 2nd ser. Zool., 1900, 11. *Idem*, Rathbun, Mem. Mus. Comp. Zool., xxxv., No. 2, 1907 46, pls. 3 and 4 (and synonymy).

A series of five specimens (3 males and 2 females) measuring from 11 to 25 mm. across the carapace are without doubt referable to the above species, although only the three smaller ones have the sculpture sharply defined, fitting more closely the description given by Alcock. The "pusful-like tubercles" referred to by that author are much more evident in the female and juvenile examples of this species, but it is unnecessary here to enlarge on variation, as Rathbun (*loc. cit.*) has already treated the subject very fully.

A very common form on the Queensland coast—large series occur in almost every collection from the area.

Locality.—Reef, North-west Islet, Capricorn Group, Queensland.

Genus *CARPILIUS* Leach (in Desmarest).

CARPILIUS MACULATUS.

(Pl. xli.)

Cancer maculatus Linnaeus, Syst. Nat., xii., edit. i., pt. 2, 1767, 1042.

Carpilius maculatus Alcock, Journ. Asiat. Soc. Bengal (n. ser.), lxvii., 2, No. 1,

1898, 79. *Idem*, McCulloch and McNeill, Rec. Austr. Mus., xiv., 1, 1923, 54.

One male specimen of record size. The carapace is 140 mm. wide and the major hand 88 mm. long (measured with the fingers closed). The present record is the first of a live specimen from Australian waters. McCulloch and myself recorded the species for the first time in 1923 (*loc. cit.*); this was based on a dried carapace and hand found washed up on the reef at Holbourne Island, Queensland.

From recent verbal reports I am led to understand that the species is not as rare on the Queensland coast as the present records tend to indicate.

Locality.—Reef, North-west Islet, Capricorn Group, Queensland.

CARPILIUS CONVEXUS.

Cancer convexus Forskal, Deser. Anim., 1775, 88.

Carpilius convexus Alcock, Journ. Asiat. Soc. Bengal (n. ser.), lxvii., pt. 2, No.

1, 1898, 79, 80 (and synonymy). *Idem*, Calman, Trans. Linn. Soc. London, viii., 1, 2nd ser. Zool., 1900, 4.

A large male example 79.5 mm. across the carapace.

This appears to be the first time the species has been recognised from the Queensland coast, where it is not uncommon on many of the islands off the mainland. Calman records it (1900 *loc. cit.*) from Murray Island, Torres Strait.

Locality.—Reef, North-west Islet, Capricorn Group, Queensland.

Genus *ATERGATIS* de Haan.

ATERGATIS OCYROE.

Cancer ocyroe Herbst, Naturg. d. Krabben u. Krebse, iii., 2, 1801, 20, pl. liv. fig. 2.

Atergatis floridus Alcock, Journ. Asiat. Soc. Bengal (n. ser.), lxvii., 2, No.

1, 1898, 95, 98. *Idem*, Grant and McCulloch, Proc. Linn. Soc. N.S. Wales, xxxi., 1906, 9.

Atergatis ocyroe Rathbun, Mem. Mus. Comp. Zool., xxxv., No. 2, 1907, 37 (and synonymy).

Four male examples, comprised of three adults measuring 35 to 50 mm. across the carapace and one juvenile measuring 11 mm.

This is one of the most conspicuous Decapod forms on the coral reefs of the Indo-Pacific Oceans.

Locality.—North-west Islet, Capricorn Group, Queensland.

Genus *ACTAEA* de Haan.

ACTAEA TOMENTOSA.

Zoerymus tomentosus H. M. Edwards, Hist. Nat. Crust., i., 1834, 385.

Actaea tomentosa Alcock, Journ. Asiat. Soc. Bengal (n. ser.), lxvii., 2, No. 1, 1898, 138, 140.

One half-grown male measuring 17.5 mm. across the carapace. Well known from the Queensland coast and a common inhabitant of the Oriental Region.

Locality.—North-west Islet, Capricorn Group, Queensland.

Genus LEPTODIUS A. M. Edwards.

LEPTODIUS SANGUINEUS.

Chlorodius sanguineus H. M. Edwards, Hist. Nat. Crust., i., 1834, 402.

Xantho (Leptodius) sanguineus Alcock, Journ. Asiat. Soc. Bengal, lxvii., 2, No. 1, 1898, 119 (and synonymy).

Leptodius sanguineus Rathbun, Bull. U.S. Fish. Comm., xxiii., for 1903 (1906), 847.

One female example measuring 23.5 mm. across the carapace.

The species is common on the Queensland coast.

Locality.—Reef, North-west Islet, Capricorn Group, Queensland.

Genus XANTHO Leach.

XANTHO CRASSIMANUS.

Xantho crassimanus A. M. Edwards, Ann. Soc. Entom. France, vii. (4), 1867, 267.

Xantho (Leptodius) crassimanus Alcock, Journ. Asiat. Soc. Bengal (n. ser.), lxvii., pt. 2, No. 1, 1898, 118, 120.

Xantho crassimanus Rathbun, Bull. U.S. Fish. Comm., xxiii., for 1903 (1906), 847.

One female example measuring 17 mm. across the carapace.

Well distributed in Queensland waters.

Locality.—Reef, North-west Islet, Capricorn Group, Queensland.

Genus XANTHIAS Rathbun.

XANTHIAS ATROMANUS.

Xanthodes atromanus Haswell, Proc. Linn. Soc. N.S. Wales, vi., 1882, 542; and Cat. Austr. Crust., 1882, 49, pl. i., fig. 1. *Idem*, Grant and McCulloch, Proc. Linn. Soc. N.S. Wales, xxxi., 1906, 12.

Xanthias atromanus Grant and McCulloch, Proc. Linn. Soc. N.S. Wales, xxxii., 1907, 151. *Idem*, Rathbun, Proc. Zool. Soc. London, 1914, 659.

One male and one ovigerous female measuring respectively 15 and 10 mm. across the carapace. Although originally described from Port Jackson in New South Wales, this is a typical reef species of the Queensland coast. It has a remarkable range of colour variation.

Locality.—North-west Islet, Capricorn Group, Queensland.

XANTHIAS LAMARCKII.

Xantho lamareckii H. M. Edwards, Hist. Nat. Crust., i., 1834, 391.

Xanthodes lamareckii Calman, Trans. Linn. Soc. London, viii., 1, 2nd ser., Zool., 1900, 11 (and synonymy). *Idem*, Grant and McCulloch, Proc. Linn. Soc. N.S. Wales, xxxi., 1906, 12.

Xanthias lamareckii Rathbun, Bull. U.S. Fish. Comm., xxiii., for 1903, pt. iii., 1906, 854.

One adult male measuring 15 mm. across the carapace.

A striking reef species with a finely granulated carapace. Occurs with the preceding species, but is not so common.

Locality.—North-west Islet, Capricorn Group, Queensland.

Genus CYMO de Haan.
CYMO ANDREOSSYI.

Pilumnus ? *andreossyi* Audouin, in Savigny's Descr. de l'Egypte, Crust., 1825, 86, pl. v., fig. 5.

Cancer (Cymo) andreossyi de Haan, in Siebold's Fauna Japonica, Crust. 1 1833, 22.

Cymo andreossyi Alcock, Journ. Asiat. Soc. Bengal (n. ser.), lxvii., 2, No. 1, 1898, 173.

One male specimen 12 mm. wide with a Rhizocephalid parasite attached under the abdomen.

Locality.—Reef, North-west Islet, Capricorn Group, Queensland.

Genus TRAPEZIA Latreille.
TRAPEZIA CYMODOCE.

Cancer cymodoce Herbst, Naturg. d. Krabben u. Krebse, iii., 2, 1801, 22, pl. li., fig. 5.

Grapsillus cymodoce Rathbun, Bull. U.S. Fish. Comm., xxiii., for 1903 (1906), 865, pl. xi., fig. 6.

Trapezia cymodoce Rathbun, Mem. Mus. Comp. Zool., xxxv., 2, 1907, 58, 59.

Idem, Biol. Res. F.I.S. "Endeavour," v., 3, 1923, 129.

Four males and two females (14 to 19 mm. wide) of this characteristic and widely distributed coral infesting species.

The males have the fine furry pubescence of the outer palm confined to the upper half, while in the females it extends lower.

Locality.—North-west Islet, Capricorn Group, Queensland.

TRAPEZIA DIGITALIS.

Trapezia digitalis Latreille, Encyclop. Methodique, x., 1825, 696. *Idem*, Alcock, Journ. Asiat. Soc. Bengal (n. ser.), lxvii., 2, No. 1, 1898, 218, 222.

Grapsillus digitalis Rathbun, Bull. U.S. Fish. Comm., xxiii., for 1903 (1906), 866.

One ovigerous female measuring 10 mm. across the carapace (including lateral spines). Unfortunately the chela are missing from the specimen, but it is referred without much doubt to this species.

The species of the genus *Trapezia* are most complex, and Dr. Mary J. Rathbun's aid was sought in the determination of the above incomplete specimen, representing a species hitherto unrecognised in Australian waters. The specimen is small and has the lateral spines pointed, while the antero-lateral spines at the outer angles of the orbits are projected sideways. These characters are also noticeable in four smaller specimens (about the same size and smaller than the above example) of a series of six before me from Ysabel, British Solomon Islands. The two largest specimens of this lot, however, have blunt lateral spines, and the antero-lateral spines are projected forwards. All but the two largest specimens have their legs spotted proximally, and longitudinally lined distally. There is also a well defined patch across the carapace between the eyes which reaches backwards from the front to half the distance across the width of the eyes. Dr. Rathbun states (*in lit.*) that none of the United States National Museum specimens of *T. digitalis* "show spots on the legs if they originally had them." Apparently her examples of the species are uniformly coloured like the two largest specimens before me, which were devoid of any colour-marking when collected.

Genus PSEUDOZIUS Dana.

PSEUDOZIUS DISPAR.

Pseudozius dispar Dana, U.S. Explor. Expd., Crust. 1, 1852, 235, pl. xiii, fig. 9
Idem, Calman, Trans. Linn. Soc. London, viii, 1, 2nd ser. Zoology, 1900, 14
 (and synonymy).

One young male and one ovigerous female measuring respectively 10.5 and 11 mm. across the carapace.

This small dainty light red species appears to have not been recognised further south in the eastern Pacific than New Caledonia, from whence it was described by A. M. Edwards as *Pilumnus nitidus* in 1873.

A group of conspicuous granules is present on the proximal half of the outer palm of the larger hand of the male specimen before me, a character which is variable in the species; this group of granules may be larger in individuals of smaller size or may be entirely absent in slightly larger specimens irrespective of sex, as proved by the examination of a series of six examples in the Australian Museum collection from New Caledonia. The granulation of the outer palm of the smaller hand appears to be constant in the species.

Locality.—North-west Islet, Capricorn Group, Queensland; on reef.

Genus PILUMNUS Leach.

PILUMNUS CAERULESCENS.

Pilumnus caerulescens A. Milne Edwards, Nouv. Arch. Mus. Paris, ix, 1873, 242, pl. ix, fig. 3. *Idem*, Alcock, Journ. Asiat. Soc. Bengal (n. ser.), lxvii, 2, No. 1, 1898, 191, 196. *Idem*, Rathbun, Proc. Zool. Soc. London, 1914, 660 (with references).

One male, two females (the smaller ovigerous). The male specimen is the smallest of the series, and measures 6.5 mm. across the carapace (including spines). The ovigerous female is a little larger than the male, being 8 mm. wide. The remaining female is 11 mm. wide. A fourth specimen is now in the collection of the United States National Museum.

The acquisition of the above examples is most interesting, as there is every reason to accept them as A. M. Edwards' species, which was originally described from New Caledonia. On not being able to refer the specimens to any known Australian species of the genus *Pilumnus*, I sought the kindly help of Dr. Mary J. Rathbun in their determination. Very few specimens have been referred to *P. caerulescens* since it was originally described. Alcock (*loc. cit.*) doubtfully records it from the Andamans, while Dr. Rathbun recognised, with a query, another specimen from Siam; the last author also recorded what she considered a variety of the species from the Monte Bello Islands, N.-W. Australia. The present record is from a locality much nearer New Caledonia (type locality) than any of the above, and as so many Decapods are common to both of the areas indicated, there appears to be little doubt that the specimens before me are true *P. caerulescens*.

The figure of the species given by A. M. Edwards is poor, and it is not unreasonable to accept the tooth shown next to the orbital tooth as being really suborbital; Alcock (*loc. cit.*) has already indicated this in his description. A. Milne Edwards remarks that the areolation evident in this species is unusual for a *Pilumnus*.

On account of the obscurity of *P. caerulescens* it was my intention to fully describe and figure the material before me, but the specimens were returned from Dr. Rathbun in America too late to give effect to my desire; I hope to do this most important work at a later date.

Locality.—Reef, North-west Islet, Capricorn Group, Queensland; from cavities in dead coral blocks.

There is another male specimen (12 mm. wide) in the Australian Museum collection from Port Denison, Queensland, which is also considered referable to the above species. Yet another example of about the same size from Saddleback Island, Queensland, was retained by Dr. Rathbun for the United States National Museum.

Family OCYPODIDÆ.

Genus OCYPODE Fabricius.

OCYPODE CERATOPHTHALMA.

Cancer ceratophthalmus Pallas, Spicilegia Zool., ix., 1772, 83, pl. v., figs. 7-8.

Ocyпода ceratophthalma Alcock, Journ. Asiat. Soc. Bengal (n. ser.), lxix., 2, No. 3, 1900, 345 (and synonymy). *Idem*, Grant and McCulloch, Proc. Linn. Soc. N.S. Wales, xxxi., 1906, 20.

One male and one female, measuring respectively 36 and 38 mm. across the widest part of the carapace.

This widely distributed Indo-Pacific beach infesting species occurred commonly at North-west Islet, and has been recorded as common on Masthead Island nearby (*loc. cit.*, 1906).

Locality.—Capricorn Group, Queensland.

Family MICTYRIDÆ Dana.

Genus MICTYRIS Latreille.

MICTYRIS LONGICARPUS.

Mictyris longicarpus Latreille, Genera Crust. et Insect., i., 1806, 40 and 41. *Idem*, McNeill, Rec. Austr. Museum, xv., 1, 1926, 102, pl. ix., and text fig. 1 (and synonymy).

An unique juvenile male example 8 mm. wide.

The occurrence of this species is unusual, as the prevailing conditions of the locality are very different to those of the mainland or mainland islands where *Mictyris* lives on the inter-tidal muddy-sand flats. I learn that there is a small quantity of silt present amongst the coral sand close inshore at North-west Islet, and it is possible that the area would sustain an occasional larva of the species which might be accidentally washed ashore. No further specimens came under the notice of the collectors during their stay of two weeks on the Islet.

Locality.—North-west Islet, Capricorn Group, Queensland.

Order STOMATOPODA.

Family SQUILLIDÆ.

Genus GONODACTYLUS Latreille.

GONODACTYLUS CHIRAGRA.

Squilla chiragra Fabricius, Species Insectorum, i., 1781, 515.

Gonodactylus chiragra Kemp, Mem. Indian Mus., iv., 1, 1913, 147, 150, 155, pl. ix., fig. 107, and text figs. 1-2 (and synonymy).

Four examples measuring 40-91 mm. from the tip of the rostrum to the end of the telson. The largest specimen is identified as var. *platysoma*.

Not uncommon off the coast of Queensland.

Locality.—North-west Islet, Capricorn Group, Queensland.

GONODACTYLUS GLABROUS.

Gonodactylus glabrous Brooks, Voy. H.M.S. "Challenger," xvi., Stomatopoda, 1886, 62, pl. xiv., fig. 5, pl. xv., figs. 7-9. *Idem*, Kemp, Mem. Indian Museum, iv., 1, 1913, 148, 150, 167, 197, pl. ix., fig. 113 (and synonymy).

Sixteen specimens measuring 20-53 mm. from the tip of the rostrum to the end of the telson.

Although this species appears to be very common on the coast of eastern Queensland, it has not been recorded from further south than Sir C. Hardy's Island, N.-E. Australia—see Henderson, Trans. Linn. Soc. London, v., 10, 2nd ser., Zoology, 1893, 454 (as *G. glaber*).

Further study of the Stomatopoda of Queensland will probably show that this species is more common on the coast than *G. chiragra*.

Locality.—North-west Islet, Capricorn Group, Queensland; on reef.

GONODACTYLUS STOLIURUS.

(Fig. 2.)

Protosquilla stoliura Müller, Verhandl. Naturf. Ges. Basel, viii., 1886, 477, pl. iv., fig. 2.

Gonodactylus stoliurus Kemp, Mem. Indian Mus., iv., 1, 1913, 149, 184 (and synonymy).

One juvenile example, measuring 20 mm. from the tip of the rostrum to the end of the telson, which agrees in all important characters with Kemp's description and the characters enumerated in his key to the species of *Gonodactylus*. The median rostral spine, however, reaches a little further than the "base of the eye stalks," and the innermost of the distal teeth of the telson are undeveloped and not very conspicuous, there being only three distinct teeth on each side.

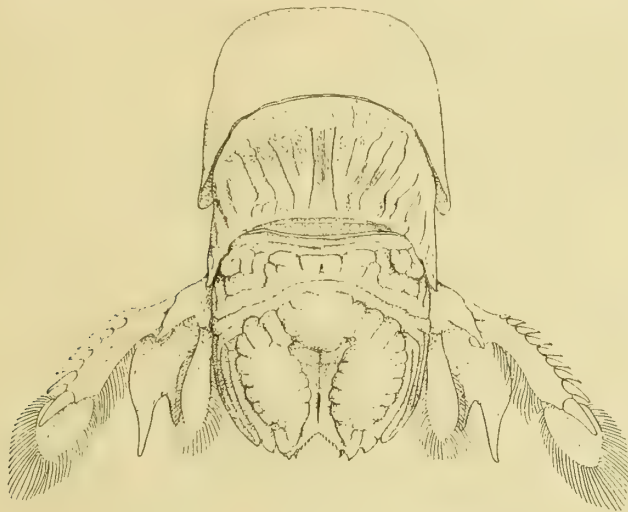


Fig. 2. *Gonodactylus stoliurus* Müller.

Last two abdominal somites, telson and uropods in dorsal view of a juvenile example 20 mm. long. (G. P. Whitley, *det.*).

Further evidence of immaturity lies in the fact that there are only nine spines instead of "ten or eleven" on the external margin of "the basal segment of the exopod."

The species has not previously been recognised from Australian waters.

Thanks are due to Mr. G. P. Whitley for the production of the original of the fine text-figure illustrating my remarks on this species.

Colour.—Uniform chocolate brown, which has not changed since preservation.

Locality.—Reef, North-west Islet, Capricorn Group, Queensland.

Order ISOPODA.

Suborder FLABELLIFERA.

Family CYMOTHOIDAE.

CYMOTHOA INDICA.

Cymothoa indica Schioedte and Meinert, Naturh. Tidsskr. (3), xiv., 1884, 250, pl. viii., figs. 1-4.

This species has not been previously noted in Australian waters; it occurs on our north-western and north-eastern coasts and is more fully dealt with by Hale (15) in a paper appearing about the same time as this present contribution.

Locality.—North-west Islet, Capricorn Group, Queensland; "from pectoral fin of *Mugil* sp." (G. P. Whitley).

Obs.—The above identification and note by H. M. Hale.

Family SPHAEROMIDAE.

CYMODOCE BIDENTATA, var.

Cymodocea bidentata Haswell, Cat. Austr. Crustacea, 1882, 291.

Two examples (male and female) of a variety with the uropods a little longer and the anterior portion of the pleon considerably shorter than in typical examples, but similarly sculptured. The specimens measure 5 and 8 mm. (measured to end of telson).

Locality.—Reef, North-west Islet, Capricorn Group, Queensland.

Obs.—The above note and identification by W. H. Baker, South Australia.

Suborder GNATHIIDEA.

Family GNATHIIDAE.

GNATHIA sp.

A series of *Praniza* larvae taken from the gill of a Blind Shark (*Chiloscyllum punctatum*). Immature specimens of these curious isopods are not uncommon in the gills of rays and sharks captured off the Queensland coast.

Locality.—North-west Islet, Capricorn Group, Queensland.

Obs.—The above note and identification by H. M. Hale.

Suborder ONISCOIDEA.

Family ONISCIDAE.

METOPONORTHUS PRUINOSUS.

Porcellio pruinus Brandt, Consp. monogr. Crust. Isop. terrestr., 19, ? year, fig. 21.

Metoponorthus pruinus G. O. Sars, Crust. Norway, ii., 1898, 184, pl. lxxx., fig. 2 (with synonymy).

This is an European species which has accidentally been introduced by man into nearly all parts of the world. By some, it is now placed under the genus *Porcellionides*, or rather this is the name they prefer to use.

Locality.—Wilson Islet, Capricorn Group, Queensland (G. P. Whitley).

Obs.—The above note and identification by Dr. Chas. Chilton.

Subclass CIRRIPELIA.

Order THORACICA.

Suborder BALANOMORPHA.

Family BALANIDAE.

Subfamily CHELONIBIINAE.

Genus CHELONIBIA Leach.

CHELONIBIA TESTUDINARIA.

Pilsbry, Bull. U.S. Nat. Museum, Washington, 93, 1916, 264, pl. 62, figs. 1-4 (and synonymy).

One example, 28 x 37 mm., was taken from the carapace of a turtle (*Chelone mydas*).

Locality.—North-west Islet, Capricorn Group, Queensland.

SOME RECENT NATURAL HISTORY OBSERVATIONS.

By W. E. J. PARADICE, M.B., Ch.M.,

Honorary Correspondent, Australian Museum.

A NOTE ON THE OCCURRENCE OF BURROWING CRUSTACEAN
Sphaeroma quoyana AT COCKATOO ISLAND, SYDNEY.

(Plate xlii.).

On the northern side of Cockatoo Island, under a wharf, and thus protected from the sun throughout the day, are to be found numerous pieces of sandstone riddled with holes made by the crustacean *Sphaeroma quoyana*. These pieces of sandstone form that portion of the foreshore of a reclaimed area, which lies between tide marks. Among the sandstone are the remains of some old piles which are completely honeycombed by the same animal.

On splitting the wood large numbers of *S. quoyana* varying in size from minute juveniles to adults, are found, often a number of animals of various sizes being present in the same burrow.

In stone only one animal is found in each burrow, and that animal exactly fits the burrow.

No small burrows and consequently no small animals were found in any stone I examined, the diameter of the burrows ranging from 6 mm. to 9 mm.

The animals enter the stone in the region of the junction of the sides with the under surface, and burrow in a direction rising slightly from the horizontal plane for a distance of about 60 mm. of which the inner 30 mm. are still white indicating recent activity, whilst the outer portion of the burrow is stained and coated with mud.

On splitting the stone a few deserted burrows were found, these being stained throughout their entire length.

In wood the animal appears to enter wherever it can, but after penetrating a short distance the tendency is for the burrow to run longitudinally with the grain.

Exactly similar sandstone lying between tide marks but outside the shade of the wharf is not attacked by *S. quoyana*.

I have recently had an opportunity to inspect certain wharves where boring animals are at work. Accompanied by Mr. F. A. McNeill I have compared notes with him on the distribution of marine boring animals elsewhere, and it appears to me that *S. quoyana* is most prolific where the salinity of the water is periodically reduced by large quantities of rain water and mud. This occurs at the head of some of our bays, especially if the water is shallow, and up the rivers and in such an area the more the sunlight is excluded from any portion of an embankment the more damage will be done there by this crustacean.

A NOTE ON THE OCCURRENCE OF ALBATROSSES IN SYDNEY HARBOUR DURING
THE WINTER OF 1926.

Plates xliii. and xliv.

On the 9th August my attention was attracted by a large Albatross (the largest that I have ever seen in the Harbour) resting on the water in Farm Cove. This bird had a white body with a certain amount of greyish mottling, a markedly hooked beak, and no conspicuous black about the tail.

Mr. Iredale, who contributed a note to this journal in 1923 on the Snowy

Albatross in Sydney Harbour, informs me that the distinguishing features of this species are first the exceptionally hooked beak and secondly the absence of black from the tail.

I am therefore of opinion that this bird was a Snowy Albatross (*Diomedea chionoptera*).

For some weeks previous to this date several pairs of Mollymawks (which are easily distinguished from the larger Albatrosses by the fact that the black of the dorsal aspect of the wing is continuous across the back) had been present in the Harbour, these birds being constant visitors to the Harbour every winter.

From August 9th to September 14th there was not a day on which I did not see a pair or more of some species of Albatross somewhere between Bottle and Glass rocks and Garden Island, and since the latter date a few birds have been present at intervals up to the time of writing (November 1st).

On most days there were two or three pairs of Mollymawks and two or three pairs of beautiful large Albatrosses with white bodies, black wings (but no black extending across the back) and, as far as could be seen from a comparatively close distance, no black about the tail feathers.

On the 2nd and 3rd September the largest number were present and they remained in a comparatively restricted area off Rose Bay.

I noted six Mollymawks, six of the larger Albatrosses described above, and a pair of birds of the same size and of similar flight, but dark brown to black all over, except for an area of dirty white which extended along the ventral aspect from under the beak to under the tail.

Between the dates abovementioned it was neither exceptionally calm nor exceptionally rough, the usual winter north-westerly breeze continuing most of the time, but on the occasion of the appearance of the first Albatrosses the Harbour was clearer than I have ever previously noticed it, in spite of the fact that there was a large amount of string-like material suspended at all depths between the surface and the bottom.

Towards the end of the period under observation the water became somewhat cloudy again.

On the 28th of September I again noticed Albatrosses in the Harbour. In the morning, off Rose Bay, there was a fine bird of striking colouring. The beak was of clean yellow and not as markedly hooked as some of the previously mentioned birds, the head was white, as was also the upper part of the neck. The back was brown with a few scattered white patches. The brown of the back continued on to the lower part of the neck and round on to the breast forming a circle around this part of the bird; it also continued outwards, making the dorsal aspect of the wings brown, except for the flight feathers which were black and continued posteriorly into the tail which was either dark brown or black. The belly was white, as was also the under surface of the wings, except for the flight feathers which tipped this surface of the wing black.

On the return trip in the afternoon this bird was still present and was now accompanied by a pair of the white bodied birds with black wings.

On the 29th and 30th September Albatrosses were still present, a strong southerly continuing throughout this period, and among the birds I noticed two of remarkable plumage. They were both very large birds, although they were obviously juveniles. The first had a white head and neck, brownish breast, and white belly. The wings were white below and brown above, with black flight feathers; the back of the bird between the wings was brown with patches of white. The tail was white with a black tip. The other bird did not have black

wings, its wings and body being white, densely mottled with grey. I regret I have not been able to remember further details concerning this bird.

These colour variations which I have noted indicate various stages in the growth of Albatrosses, the Snowy Albatross (*D. chionoptera*) and the Wandering Albatross (*D. exulans*) both being represented, and if the absence of black on the tail is pathognomonic of the Snowy Albatross this species has been far more common than the Wandering Albatross in Sydney Harbour this winter.

According to Mr. Iredale, Albatrosses were plentiful in the Harbour during the winter of 1923, rare during 1924 and 1925, and now they have been plentiful during 1926.

A NOTE ON THE HABITS AND STATION OF *Centrostephanus rodgersii* IN
PORT JACKSON.

One of our most conspicuous sea urchins is *Centrostephanus rodgersii*, it being a dark brownish purple in colour with long hollow brittle spines, which have a greenish iridescence in certain lights, and with a bright reddish membrane surrounding the mouth.

Station.—It is found among rocks in the zone extending from low water mark to a depth of about six feet below, and occasionally making its way into the zone between tide marks, in localities sufficiently close to the ocean to be little influenced by mud and fresh water.

In Sydney Harbour the species occurs in large numbers between South Head and Bottle and Glass Rocks, but rapidly decreases in numbers as the Harbour is ascended.

I have not met with it above Bradley's Head, although other species are common along a great length of rocky foreshore above that locality.

Habits.—During the day *C. rodgersii* is usually found in crevices between rocks.

At night they leave the crevices and wander about on the surface of rocks, some of them whilst the tide is high, making their way over rocks which are exposed for one or two feet at low water, but returning to the crevices by day-break.

I have on one occasion seen considerable numbers of these animals on the surface of a large flat rock during the cold part of the year, and the rock was situated about four feet below low water mark.

Even at low spring tides comparatively few of these urchins are found in situations where they are exposed to the atmosphere.

C. rodgersii is recorded from Lord Howe Island among coral, whilst an allied species with extremely sharp spines occurs among the coral of the Great Barrier Reef.

OBSERVATIONS ON THE BREEDING OF THE BLACK SWAN (*Chenopsis atrata*) AND
THE BLACK DUCK (*Anas superciliosa*) IN CENTENNIAL PARK, SYDNEY,
DURING AUGUST, 1926.

During the first week of August I noticed a Black Duck swimming with nine very young ducklings in a pond at Centennial Park. Seven were dark brown, as is ordinarily the case with the young of this species, while two were the yellow of the duckling of a white strain of a domestic duck.

On looking round the pond I was able to locate three more Black Ducks (or drakes of that species) some distance off, and a bird of approximately the size,

white in colour, but with the dark metallic tinted flight and tail feathers of the drake of the Black Duck. This observation seems of interest, as it suggests interbreeding between the native Black Duck and a domestic species; a likely enough happening should a Black Duck be kept in captivity with domestic species, but hardly to be expected among birds which are for all practical purposes in the wild state and free to pick their partners as they choose.

On the 30th September I noticed that the ducklings were well feathered and that the white birds were definitely larger than the dark members of the brood, indicating that the biogens of the larger white strain were already producing their effect.

It may also be of interest to note that at this particular time a pair of Black Swans which had been present all the winter, were building their second nest by breaking off or bending green reeds until they had a floating mass of five feet in diameter.

The first nest in which eggs were laid was built in a similar manner some three months previously in another part of the pond, but was destroyed before any brood was hatched.

On 16th October four cygnets covered with grey down, about the size of Indian Runner ducks, were seen accompanying their parents, evidently having been hatched in the second nest.

REVIEWS.

CHECK LIST OF THE BIRDS OF AUSTRALIA.

"The Official Check List of the Birds of Australia" (second edition) is the full title of a work compiled by a Committee of the Royal Australasian Ornithologists' Union, printed at Melbourne by the Government Printer.

As compared with the first edition, published in 1913, the dying effort of the old conservative order which expired from senile debility as soon as it left the press, this edition represents a very great advance in the right direction, but it is still cramped by the spirit of its ancestor. While the first edition clung to certain imaginary specific *Nomina conservanda*, the second clings to "large genera," but by way of compromise prints most of the recent generic divisions in italics. The result is unwieldy. Take PACHYCEPHALA (*GILBERTORNIS*) RUFOGULARIS as an example of dozens of similarly expressed names, and when a subspecific name is added the quadrinomial whole is simply appalling. The Committee virtually adopted Gregory M. Mathews' latest Check List in all salient particulars as regards specific names. If it was considered necessary to "lump" his admittedly too finely split genera, why not do so wholeheartedly? As regards generic divisions there will always be division of opinion, and so long as a compiler of a reference list is sound on the question of priority as regards specific names, he is not bound to accept every new generic subdivision that may be proposed. He should be consistent, however, and it would therefore have been much better if the Committee in this case had possessed the courage of their own opinion, and simply rejected such generic distinctions as they considered not unreservedly acceptable.

While the result of Mathews's untiring research as to specific priority of upwards of fifteen years has been accepted in nearly every instance, a few cases occur where the old "conservatism" has retained a name, such as *Dacelo gigas*,

which Mathews has satisfied himself must yield to one with a claim to priority of Boddaert, which Mathews has satisfied himself must yield to one with a claim to priority of publication, viz.: *Dacelo novae-guineae* Hermann. (Vide *Emu*, xxvi, 1926, 148).

In the grouping of subspecies, accepted as such by the Committee, under the dominant species name, lies the main difference (other than genera lumping) between Mathews's 1923 Check List and the one under review. The Committee say "Mr. Mathews regards some of the species accepted for the Check List as subspecies. As other members of the Check List Committee have the advantage of knowing the birds concerned in the field, and have in addition been able to examine much museum material, it has been decided, after a re-examination in each case, that certain Australian birds listed by Mr. Mathews as subspecies should be retained as full species . . . and that certain species accepted by Mr. Mathews were not entitled to specific rank." Even had the Committee had access to the Mathews collection of skins upon which he based his opinion—and they had not such access—the matter would after all resolve itself into a question of individual opinion as to the validity or invalidity of a proposed subspecies. The actual differences, therefore, between the two Check Lists is so slight, and the major part of the work of classification having already been done and published by Mathews, that it is not quite clear why this new Check List should be wholly credited to the R.A.O.U. It is true that a very valuable (and original) appendix has been compiled by Mr. Harry Wolstenholme (not a member of the Check List Committee) entitled "The Scientific Names of Australian Birds (with notes, vocabularies, and pronunciation of the accepted names)." This Appendix, and the reasonable price (12/6) of the Check List may be regarded as its chief recommendations to public favour. That it will necessarily be accepted as the only "official" Check List of Australian Birds is more than doubtful.

AN AUSTRALIAN ENCYCLOPAEDIA.

Messrs. Angus & Robertson, Ltd., have published a work which will be an ornament and a valuable adjunct to the library of every Australian. Apart from the all-embracing nature of this great work of reference, which contains informative articles on everything in Australian economics, art and literature, it deals comprehensively but concisely with all the branches of Australian natural science from aboriginals to zoophytes. The names of those responsible for the various group-subjects are sufficient guarantee of their accuracy and scientific value. The marsupial and other mammalia were dealt with by the late Emeritus Professor Haswell, the mollusca by the late Charles Hedley, and the fishes by the late A. R. McCulloch. Their work in this great publication is a fitting epitaph. W. B. Alexander deals with the birds, and there are articles from the skilled pens of G. A. Waterhouse, A. Musgrave, E. W. Ferguson, H. Hacker, H. J. Carter, R. J. Tillyard, and A. M. Lea, in entomology, E. A. Briggs, F. A. McNeill, H. A. Longman, H. J. Burrell, L. Harrison, T. C. Roughley; T. Harvey Johnston and others in zoology.

The work was edited by A. W. Jose and H. J. Carter, and the illustrations, particularly the coloured plates, are of outstanding merit.

A MONOGRAPH OF THE AUSTRALIAN LORICATES.

(Phylum MOLLUSCA—Order LORICATA.)

By TOM IREDALE and A. F. BASSET HULL.

VIII.

APPENDIX B.

PALAEOLORICATA.

Fossil Loricates were first brought under the notice of Australian workers in a paper by Etheridge (Rec. Geol. Surv. N.S.W., v., pt. 2, January, 1897, 67-70, figs. in text) wherein he described *Chelodes calceoloides* from the Upper Silurian of New South Wales.

A few years later Ashby and Torr published an essay entitled "Fossil Polyplacophora from Eocene Beds of Muddy Creek, Mornington (Schnapper Point) and Moorabool, Victoria, with definitions of nine new species, and notes on others" (Trans. Proc. Roy. Soc., South Austr., xxv., pt. ii., 1901 (December), 136-144, pl. iv.). The species described were *Lorica compressa* (p. 136, pl. iv., fig. 6: no loc.), *Lorica affinis* (p. 137, pl. iv., fig. 7: no loc.), *Loricella gigantea* (p. 137, pl. iv., fig. 3: Mornington), *Plaxiphora concentrica* (p. 138, pl. iv., fig. 8: no loc.), *Plaxiphora gellibrandi* (p. 139, pl. iv., fig. 1: Eocene beds, Gellibrand, Victoria), *Acanthochites (Notoplax) granulosus* (p. 139, pl. iv., fig. 9: Schnapper Point), *Acanthochites rostratus* (p. 140, pl. iv., fig. 5: Schnapper Point), *Chiton fossicus* (p. 140, pl. iv., fig. 4: Table Cape), and *Chiton paucipustulosus* (p. 141, pl. iv., fig. 2).

Hall then wrote "On the Occurrence of Two Species of *Cryptoplax* in the Tertiary Rocks of Victoria" (Proc. Roy. Soc. Vict., vol. xvii., n. ser., 1905 (February), 391-3, pl. xxx.) naming *Cryptoplax pritchardi*, p. 391, pl. xxx., fig. 1-6 from the upper beds of Muddy Creek regarded as Kalimnan, and *C. gatliffi* p. 392, pl. xxx., figs. 7-9 from the lower beds of Muddy Creek distinguished as Balcumbian. Hall there explains that while the lower beds have been recorded as Eocene, the upper beds were termed Miocene or even Older Pliocene, and in order to avoid disputes a local terminology was preferable as above and the lowest beds were called Balcumbian, the lower Janjukian and the upper Kalimnan. These names are more or less accepted and only minor differences still exist, the present usage being that the Balcumbian would better compare with the Oligocene, the Janjukian with the Miocene and the Kalimnan with the Lower Pliocene.

We are not discussing these at present but will use them with reserve.

Chapman, writing upon "New or Little-known Victorian Fossils in the National Museum, pt. ix., Some Tertiary Species" (Proc. Roy. Soc. Vict., xx., n. ser., 1908 (March), 218, pl. xviii., figs. 5-7) figured the posterior valve of *Acanthochites granulosus* Ashby and Torr, questioning their association with *Notoplax* as the tail valve differed but transferred the species to *Ischnochiton* in the sub-genus *Ischnoplax*. This location was much more extraordinary than Ashby and Torr's, and really had no basis at all.

A little later Hull distinguished *Lorica duniana* (Proc. Linn. Soc. N.S.W., xxxv., 1910, 654, pl. xvii., figs. 1-2) from Table Cape, contrasting it with the recent *L. volvox* Reeve, figuring a Sydney example of this species. Hull then added in the same periodical (xxxix., 1915 (February 26), pp. 855-857) three

species of *Loricella* from the Table Cape beds, Tasmania, recording many valves of *Lorica duniana* and a valve of *Chiton fossicus*. The species were named *Loricella magnifica* (p. 856, pl. xciv., figs. 1-1a), *L. octoradiata* (p. 856, pl. xciv., fig. 2) and *L. atkinsoni* (p. 856, pl. xciv., figs. 3-3a). The following year Iredale and May dealing with recent "Tasmanian Chitons" pointed out (Proc. Malac. Soc., xii., 1916 (November 28), p. 112) that two species of recent *Lorica* had been confused and that the southern form *Lorica cimolia* appeared to be inseparable from the fossil described as *Lorica duniana* Hull.

Ashby then added another *Loricella* from the Table Cape beds, *L. sculpta*, (Proc. Roy. Soc. Tasm., 1921 (August 30), 38, pl. xv., figs. 1-2).

Finally in a somewhat pretentious paper entitled "Monograph on Australian Fossil Polyplacophora (Chitons)" Ashby (Proc. Roy. Soc. Vic., xxxvii., n. ser., 1925 (November 30), 170-205, pls. xviii.-xxii.) has reviewed the species, introducing new families and new genera on features of valves scarcely considered of any value in connection with recent species.

It is obvious to every conchologist that to provide a scheme of classification that will satisfactorily cover both recent and fossil species, much more knowledge of the latter must be gained before the attempt is made. Thus careful monographers such as Pilsbry and Thiele found it expedient to omit the discussion of the fossil forms of Loricates in their respective works. While the classification of recent species is based on shell features, great stress is laid upon girdle characters and much assistance has been gained from the formation of the radula.

Fossil Loricates are mainly represented by valves more or less worn and consequently their determination exactly is impossible. By analogy they are contrasted with the valves of recent species and thereby considered, but this is an unsatisfactory method. The variation of valves in many recent species is known to be very considerable and the separation of odd fossil valves from the same locality is fraught with disaster. This has been done in the past so that we cannot regard the conclusions as representative of the real facts, but only as temporary expedients. Consequently we cannot truly regard our fossil Loricates otherwise than in terms of doubt.

We have a few facts to deal with and from study of these little can be gained of the evolution of the Loricates as yet. Certainly most ancient forms such as *Chelodes* are not by any means primitive, but show great specialization if they be Loricates at all. In the opinion of the writers *Chelodes* could not possibly be a Loricate unless it were accepted as a most specialized form, a conclusion curiously in contrast with its age. However, for the use of students we give an outline of the classification published by Fischer in the Manuel de Conchyliologie, forty years ago. There has been no amendment of importance since, as no further knowledge has been added.

Incorrectly Fischer introduced a subgenus *Eochiton* to include all the northern Palaeozoic forms. This he subdivided into many sections, using those already named.

Thus: *Helminthochiton* Salter, 1846. *H. griffithi* Salter, Silurian.

Gryphochiton Gray, 1847. *G. priscus* Munster, Carboniferous.

Chonechiton Carpenter, 1882. *C. viseticola* Ryckholt, Carboniferous.

Glyptochiton Koninek, 1883. *G. cordifer* Koninek, Carboniferous.

Priscochiton Billings, 1865. *P. canadensis* Billings, Silurian (lower).

Pterochiton Carpenter, 1882. *P. gemmatus* Koninek, Carboniferous.

= *Anthrachiton* Rochebrune, 1882.

= *Rhombichiton* Koninek, 1883.

Loricites Carpenter, 1882. *L. concentricus* Koninck, Carboniferous.

Cymatochiton Dall, 1882. *C. loftusianus* King, Permian.

= *Protalochiton* Rochebrune, 1882.

Probolacum Carpenter, 1882. *P. corrugatum* Sandberger, Devonian.

Even Fischer regarded as doubtful Loricates:

Chelodes Davidson and King, 1874. *C. bergmani* David, Silurian.

Sagmaplaxus Oehlert, 1881. *S. sarthacensis* Oehlert, Devonian.

Beloplaxus Oehlert, 1881. *B. sagittalis* Sandberger, Devonian.

And noted as still more doubtful:

Sulcochiton Ryckholt, 1862. *S. grayi* Ryckholt, Carboniferous.

Etheridge's observation "*Chelodes* has been ascribed at different times to a *Chiton* by Barrande, a provisional Brachiopod by Lindström, an operculate coral by Davidson and King, an *Aptychus* by Von Ihering, and lastly relations have also been suggested with the Cirripedia" is illuminating, as it will be noted that each specialist has discarded it and suggested its reference to some other group. We would agree that it can be better placed elsewhere, as we can see nothing in it to class it as a Loricata. Consequently the species we now illustrate and describe can be regarded as the earliest Australian Loricata and of its Loricata character there can be no possible doubt.

PERMOCHITON AUSTRALIANUS n. gen. and sp.

Plate xlv.

The specimen is a complete cast showing the whole eight valves in position, embedded in a matrix of ferruginous fine-grained sandstone, from the permocarboniferous of Bundanoon, New South Wales, collected by the late W. T. Willcox.

The cast is of medium size, elevated, semi-keeled, sides regularly sloping, posterior valve with the mucro anterior; from the separation of the valves there appears to have been well-developed sutural laminae, though no insertion plates can be discerned.

Overlying the cast were two pieces of matrix showing the sculpture of the exterior; this appears to be of the nature of the recent *Ischnochiton* or *Lepidopleurus*, it cannot be determined exactly which: the lateral areas of the median valves show deep curved growth lines such as are seen in some of the species referred to those genera, while the median areas are longitudinally lined in a sloping manner agreeable with either but not showing beads as distinctly as seen in the small Australian Lepidopleurids: the impression of the anterior valve shows concentric grooving rather more closely than that of *Lepidopleurus*, and more so than that of any recent *Ischnochiton*.

On the whole this cast and sculpture differs little in style from that of recent species, and in size and form it is also comparable.

We have taken the extreme course of naming this beautiful Loricata cast as distinct, as any other method would cause more confusion than do any good.

The type is in the Australian Museum.

Analysing the recorded Loricata fauna in terms of age we find that we get curious results thus:—

Balcombian (Oligocene): *Lepidopleurus magnogranifer* Ashby, *Protochiton granulatus* Ashby and Torr, *Afossochiton cudmorei* Ashby, *Afossochiton rostratus* Ashby, *Acanthochiton chapmani* Ashby, *Cryptoplax gatliffi* Hall.

Janjukian (Miocene): *Chiton fossicius* Ashby and Torr, *Lorica compressa* Ashby and Torr, *L. affinis* Ashby and Torr, *L. duniana* Hull, *L. cudmorei* Ashby, *Protolorica atkinsoni* Ashby, *Loricella gigantea* Ashby and Torr, *L. magnifica*

Hull, *L. paucipustulosa* Ashby and Torr, *L. atkinsoni* Hull, *L. octoradiata* Hull, *Pseudoloricella sculpta* Ashby, *Plaxiphora concentrica* Ashby and Torr, *P. gellibrandi* Ashby and Torr.

Kalimnan (Lower Pliocene): *Cryptoplax pritchardi* Hall, *Callistochiton meridionalis* Ashby.

The Balcombian being the oldest series, we find a species of *Lepidopleurus* living alongside a *Cryptoplax* and *Acanthochiton* with two extinct groups *Protochiton* and *Afossochiton*. There can be little hesitation in regarding the *Lepidopleurus* as doubtful as there is no character in the single eroded valve on which it was based: it looks more like that of an *Ischnochiton*. The *Cryptoplax* was also based on a single specimen which does not appear to be a Loricata valve at all: it should be discarded, the turned-in apex being fatal to its inclusion. The *Acanthochiton* was also based on a "considerably damaged median valve" unfit to class as anything, and might be referable to any genus, though it may be a Loricata valve.

Protochiton is a most interesting specialized relative of *Acanthochiton* in which the posterior valve has lost the insertion plate. We have shown how this occurs in this family in the genus *Craspedoplax* which has the posterior valve with the insertion plate well developed and toothed and which in some aged shells shows the insertion plate degenerating into a callus. This is not a primitive feature, but the result of specialization and the fact that such is seen in the Balcombian is of great importance, suggesting the extreme age of the group. This loss of the insertion plate cannot be regarded as of more than generic value and in the recent *Craspedoplax* we have not given it that rank. The valves for which *Afossochiton* was created do not show any characters worthy of generic rank, as we have shown that the recent species *Acanthochiton kimberi* Torr shows similar insertion plates lacking slits: in the case of the recent species, again the loss of slitting is purely due to degeneration and is not of primitive significance.

Consequently Balcombian Loricata do not display any features that can separate them widely from the recent Australian Loricata fauna.

The Janjukian Loricata fauna appears to be almost inseparable from that living in the adjacent waters to-day. While many species have been named there can be little doubt that more material will reduce the number. The genera represented are all specialized, another curious and unexpected result, confirming however the little information we have of the older forms. Thus the *Chiton fossicius* Ashby and Torr appears to be a *Rhyssoplax* and very specialized at that, while *Rhyssoplax* itself is regarded as one of the most specialized of the family. *Lorica* and *Loricella* are present, and so many valves have been found that not only many species but even genera have been differentiated. Their relationship with the recent species is so close that single valves cannot always be separated from recent specimens. As there are two distinct species of *Lorica* living in East Australia, a third in West Australia and a fourth in New Zealand, it is possible that the ancestral fossil would be variable, showing features of two or more of these species. It is suggested that if there be more than one species of *Lorica* present in the Table Cape beds they would be restricted to distinct horizons. Intensive collecting would alone solve that problem. *Lorica* is a very specialized genus and the presence of a posterior valve lacking the posterior sinus among the fossils has led to the proposition of a genus *Protolorica* which would be an ancestral form. Curiously enough this valve is credited with numerous eyes, another very specialized feature, and at the present time both *Lorica* and *Protolorica* are recorded from the same beds.

Loricella seems an even more specialized Loricata than *Lorica* and here again the fossil valves show so much variation that many species have been named. It must be noted however that the recent *Loricella* also shows similar variation, specimens living together being so different that it has even been suggested that they might represent different species. Series however show that the variation is individual, as in some specimens the sculpture varies from one style to the other. There can be little doubt that intensive collecting will reduce the number of species and may even include the heavily sculptured form for which a genus *Pseudoloricella* has been formed. The valve on which this was founded is very like a recent valve but lacks the spade-like process between the sutural laminae; this is a very specialized item, as it can be seen developing in the genus *Kopionella*, and unfortunately the valve is at present unique. In any case we have here again no primitive features in the known species, as the only other record is of a *Plaxiphora* which is so like the recent *Poneroplax* that no feature of separation could possibly be given that would stand criticism. Two species were named, but one is now admitted to be a recent valve, so no further comment is necessary. To sum up, the Janjukian Loricata fauna appears to have been very like that of to-day, and more intensive collecting will probably bring to light more species of different genera.

Only two species have been recorded from the Kalimnan and these are a *Cryptoplax*, and a *Callistochiton* which has been regarded as conspecific with the recent species living in the same district. The *Cryptoplax* is of importance, as it does not seem to be altogether the same as the recent species, but as only worn specimens have yet been found there can be no dogmatism.

We can thus see that our fossil Loricata fauna does not help us at all, or, rather, it proves that the most specialized of our living Loricates were fully developed as early as the Balcombian, and that at that stage no primitive forms persisted. We do not regard the *Lepidopleurids* as primitive forms, but as degenerate ones, and the fossil Loricates appear to confirm our view.

It may be noted that recently Stillman Berry monographed the "Fossil Chitons of Western North America" (Proc. Calif. Acad. Sci., xi., 1922 (May 16), 399-526, pls. 1-16, text-figs. 1-11) and in so doing handled 1,065 valves. He admitted one species from the Oligocene, for which he proposed a new genus and species: the rest were Pleistocene, save two which were Pliocene. The latter were determined as conspecific with recent species, while most of the Pleistocene were naturally recent forms.

The Paris Basin fossils are generally regarded as of Eocene age, so that it is of interest to note that many species were described by Rochebrune in 1881, but his work was so bad that it was entirely repudiated by Cossmann in 1889 (Ann. Soc. Malac. Belg., xxiii., 14-20). Cossmann admitted ten species, nine of which were referred to *Chiton*, the tenth to *Enoplochiton* (later *Anisochiton*). Nine of Cossmann's illustrations (pl. i.) show Loricates of recent appearance, some even having pectinated teeth in the insertion plate of the anterior valve; the tenth, which he refers to *Anisochiton*, shows a curious posterior valve. In his later revisions Cossmann does not appear to refer to these shells again.

Sacco (I Molluschi terr. Piemonte e Liguria, pt. xxii., 1897, 89-91) recognised six or seven species, referring to them as probably only varieties of the recent shells living in the Mediterranean. Posterior valves were common, and very like those of recent species, especially *Acanthochiton*.

It will therefore be seen that the North American and European fossil Loricates bear the same relation to existing forms, as do the Australian fossils.



Carpilius maculatus Linn.

A male specimen of record size, 140 mm. wide, from North-west Islet,
Capricorn Group, Queensland.

Photograph by A. Musgrave.



A.



B.

THE BURROWING CRUSTACEAN *Sphaeroma quoyana*.

A. Burrows in sandstone, one containing an animal.

B. Examples of affected sandstone and wood, the latter showing several animals *in situ*.

Photographs by W. E. J. Paradise.

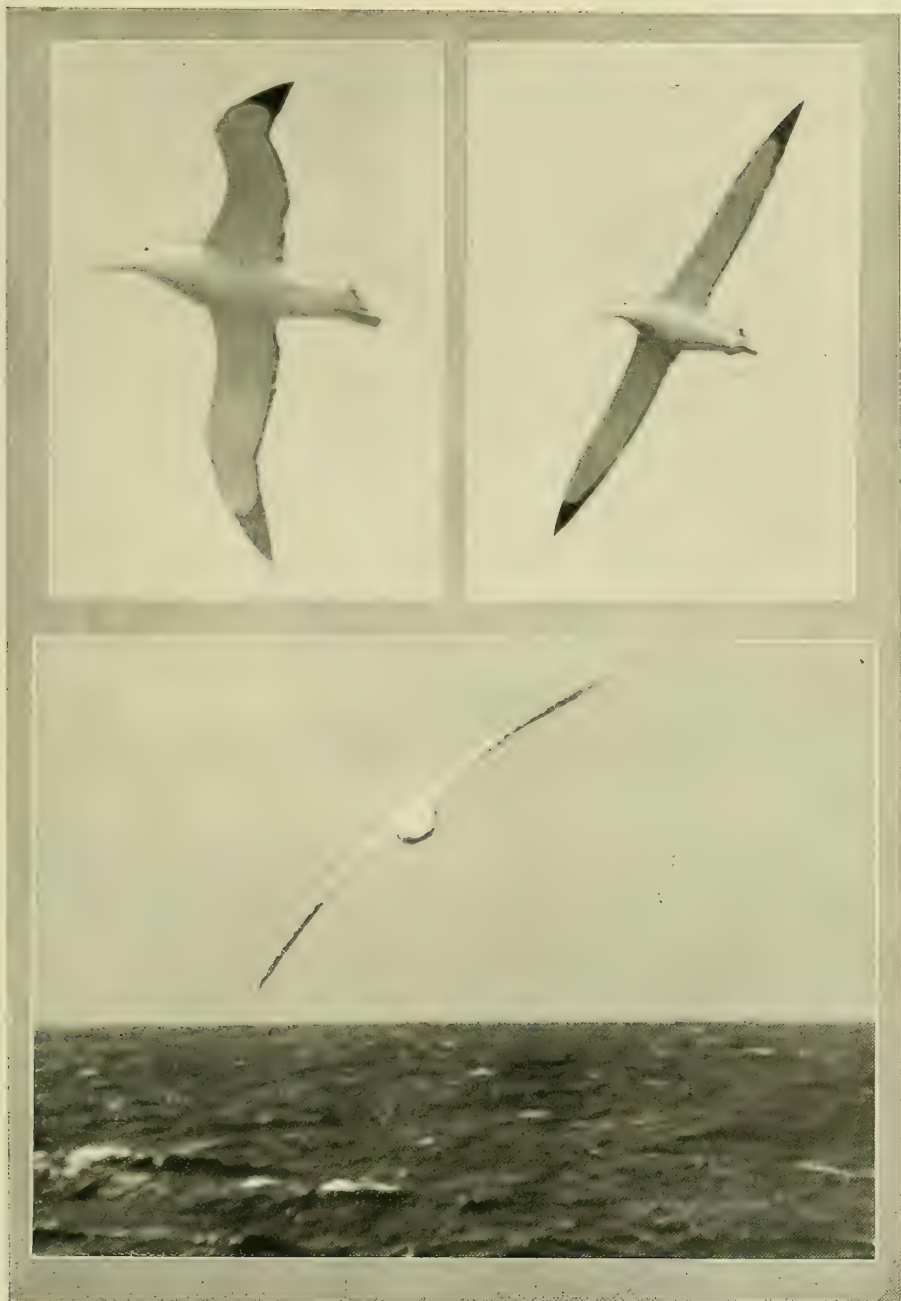
Albatrosses



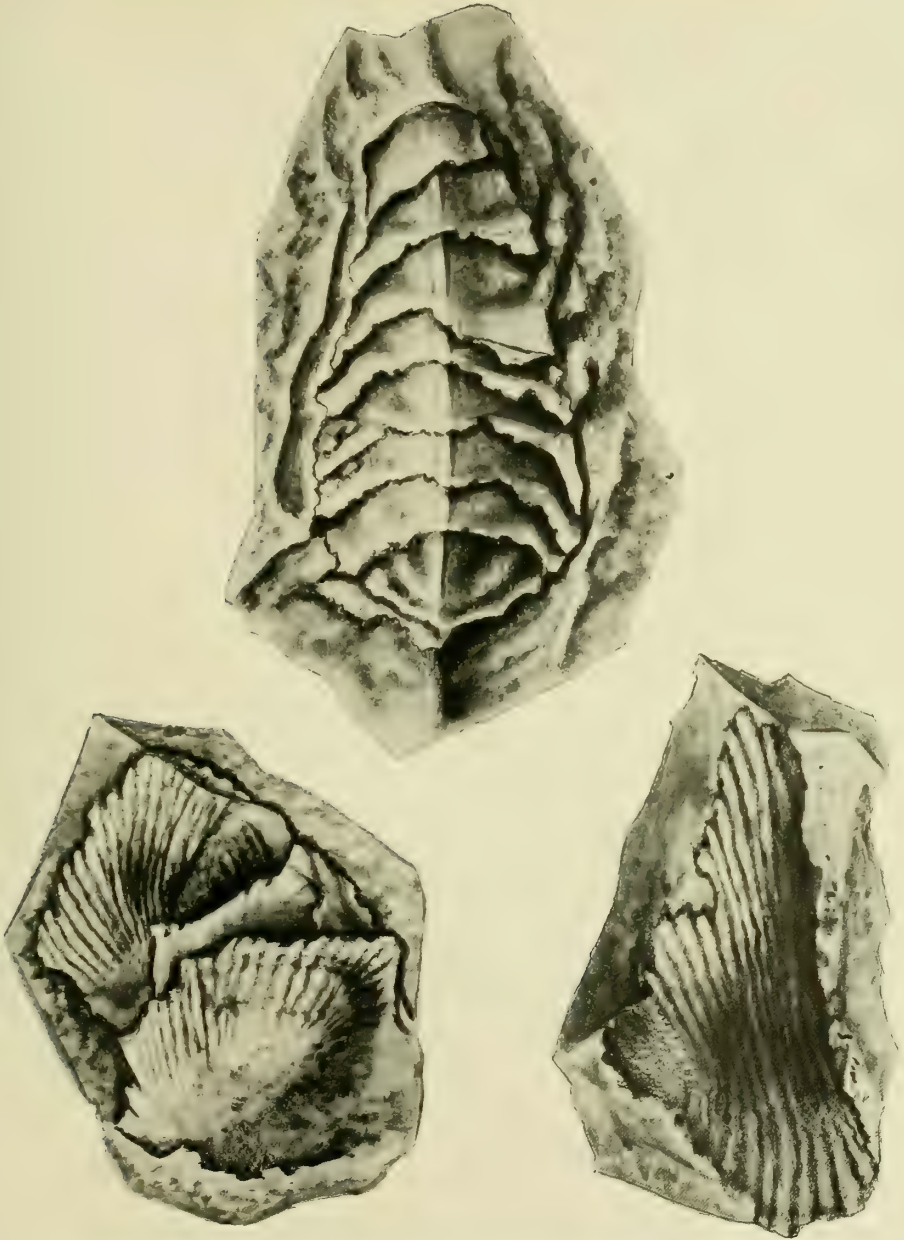
In Sydney Harbour.



and outside the Heads:



ALBATROSSES ON THE WING, from photographs taken by E. F. Pollock, on a voyage from Lord Howe Island to Sydney.



Permoichiton australianus Iredale & Hull, showing the complete cast, and two portions of the overlying matrix in which the sculpture is well defined.
Drawn by Joyce K. Allan.

Royal Zoological Society of New South Wales.

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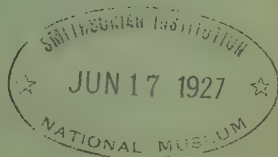
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Royal Zoological Society of New South Wales

Representation on Public Park Trusts.

It will be remembered that the scientific societies have from time to time urged their claims to representation on the Trusts which control the Public Parks and the Australian Museum. These claims were favourably considered by Ministers of the Crown, and it was stated that the necessary legislation would be introduced. Circumstances have prevented, or, rather postponed this action, but so far as is possible under existing legislation steps have been taken to appoint naturalists to such vacancies as have occurred in the Trusts as at present constituted. The ground is thus being prepared for the more specific representation of the great incorporated scientific societies, as such, by the contemplated legislation. In addition to his appointment as a member of the Taronga Zoological Park Trust, Mr. A. F. Basset Hull has been appointed to the Ashton Park Trust; Mr. A. H. Chisholm and Mr. G. M. Goldfinch have been appointed to the National Park Trust, and Mr. Harry Wolstenholme has been appointed to the Kuringai Chase Trust. Amongst the more recent elections to fill vacancies occurring on the Australian Museum Trust, the names of Professor Harrison, Dr. G. A. Waterhouse, and Messrs. E. C. Andrews, and R. H. Cambage may be mentioned. The latter were, of course, elected by the other Trustees, while the appointments to the Park Trusts were made by the Governor on the recommendation of the Minister for Lands. That all the abovenamed appointees are members of this Society is a matter for congratulation, while the Royal and Linnean Societies, of which some are members, may also consider that their claims to representation have been recognised.

Changes in Council Membership.

Owing to his intended departure from Sydney, Mr. D. G. Stewart resigned his seat on the Council and the office of Honorary Treasurer. Mr. P. Shipway has been elected Honorary Treasurer for the remainder of the current year.

The serious and long illness of Dr. E. W. Ferguson has compelled him to resign from the Council. His resignation has been accepted with deep regret, and the hope is expressed that he may recover his health sufficiently to rejoin the Council after the Annual Meeting.

The two vacancies thus occurring have been filled for the unexpired term of the current year by the election of Mr. A. H. Chisholm, the well known writer of "Ways of the Wild" in the "Daily Telegraph" and joint Editor of the "Emu," and of Surgeon Commander W. E. J. Paradise, to whose initiative the establishment of the Marine Zoological Section is due. These gentlemen will retire under Article 23 at the end of June next, but will be eligible for re-election for the term of three years at the next Annual Meeting.

New Members.

The following new members have been elected since publication of the last list (30th November, 1926):—

Ordinary Members.—Norman C. Bucknell, O.B.E., John F. Henderson, John A. Henderson, T. H. Nicolle, John R. Wallace, and A. Leslie Walker.

Associate Members.—W. L. Anderson, Gilbert Bates, A. Bailey, H. O. Fletcher, and R. A. Johnston.

Expedition to Queensland Islands.

Mr. E. F. Pollock, who organised the expedition to North-west Islet in 1925 is arranging for another outing to several islands on the Great Barrier Reef, in November next. The expedition will occupy four or five weeks, and full particulars may be obtained from the organiser, address "Te Whare," Carrington Avenue, Strathfield, N.S.W.

EGGS OF THE CHANNEL BILL CUCKOO.

(*Scythrops novaehollandiae* Lath.)

Mr. Moresby Propsting furnishes the following interesting notes on an unusual Cuckoo combination:—

"One day during the Christmas holidays I was riding down Mountain Creek, near Richmond, North Queensland, when I saw a Crow slip silently out of a dense coolabah. I rode up under the tree, and located a nest far out on a thin branch. As it was a difficult nest to negotiate, and I had a sufficiency of Crow's eggs in my collection, I decided to leave it. The next day, when passing the same spot, I changed my mind, and climbed the tree. The branch on which the nest was situated appeared even thinner than when viewed from the ground, but by exercising great care I reached the nest, which was constructed of coolabah and thorny mimosa twigs, lined with horsehair and pieces of wool. It contained ten eggs, four Crow's and six Storm Bird's. This extraordinary find well repaid me for the risk taken in climbing out on the thin limb. I have taken many Storm Bird's eggs, but generally one at a time. They are always larger than the Crow's eggs, and though somewhat similar in markings are easily separated from the foster parent's eggs."

Both North and Campbell publish records of instances where two eggs of the Channel-Bill Cuckoo (or Storm Bird, as it is called in many localities) were taken from the one nest, either of a Strepera or Crow, but Mr. Propsting's remarkable clutch seems to be unique! I have discussed the matter with Mr. Propsting's father, who recollects the finding of the clutch, which is still in his son's possession. He informed me that he had personally observed a pair of Crows feeding three young Storm Birds at a nest which was too small to accommodate the foster brood which was grouped round the nest.

There are records of a young Channel-Bill ejecting a young *Grallina* from the nest. What appears most remarkable is that the Cuckoo habit of ejecting the other young birds should be suspended when it is a full and not a foster brother that is concerned.

CALOUNDRA SHELLS.

By TOM IREDALE.

(By permission of the Trustees of the Australian Museum.)

Plate xlv.

Everyone who visits Caloundra collects shells. The beaches are strewn with large Cassids and Cocksles of attractive appearance, intermingled with which many larger and smaller shells occur. In the rock crevices about highwater mark multitudes of still smaller shells are jumbled together, washed backwards and forwards by the tides so that a shelly débris rich in perfect specimens is available for searching. Where then is this El Dorado of the shell collector?

It really merits this appellation, as every visit reveals some golden treasure, some specimen of rarer beauty than hitherto, perchance a wanderer from the Tropics, or even some previously unknown molluscan gem.

Caloundra lies at the north end of Moreton Bay, some sixty miles from Brisbane, but the railroad from that place goes inland so that the nearest railway station is some thirteen miles distant from the beach. This comparative inaccessibility keeps it still remote, so that to-day it is little more visited than twenty years ago, a few motorists being the additional pleasure seekers. As a consequence shells are still plentiful, though at many beaches on the east Australian coast surf bathing has driven away the majority of the large species of molluscs.

The locality is not unknown to the scientific world, as Queensland naturalists have found it a favoured spot, especially as fishing is excellent in the neighbourhood.

At the end of 1902, Mr. (now Dr.) H. L. Kesteven visited Caloundra in the interests of Mr. Hedley, and the collection made was presented by the latter to the Australian Museum. No list was published, though one was made, a copy of which I have before me, cataloguing no fewer than 373 species. This number well indicates the richness of the locality. Dr. Shirley with parties visited there, and a few species were recorded thence by him.

In February, 1909, I exploited the locality for Loricates, also making a general collection in the few days available. I was extremely impressed, and recorded the Loricata fauna (Proc. Malac. Soc. (Lond.) Vol. ix., June, 1910, 156-7) suggesting that it was of purely Peronian basic origin, contrasting with that observed at Port Curtis a few days previously which was just as surely Solanderian. A few years later Dr. T. Harvey Johnston made a study of the littoral fauna from the ecological viewpoint, contributing an important paper entitled "Ecological Notes on the Littoral Fauna and Flora of Caloundra, Queensland" to the Queensland Naturalist (Vol. ii., April, 1917, 53-63). In that paper the general nature of the beaches and rocks are detailed, together with a preliminary account of the organisms living between tide marks.

Mr. A. F. Basset Hull, my collaborator in the Monograph of the Loricates now appearing in this Journal, visited Caloundra in 1921 and 1922, and confirmed my conclusion as to its wealth in this group.

Otherwise Mr. George Gross, of Brisbane, a very enthusiastic conchologist, had long collected in the locality, but this worker never published anything, although his collection, which I had the pleasure of examining in 1909, and which passed into the possession of Sir Joseph Verco, of Adelaide, South Australia, was probably the most extensive yet made of south Queensland mollusca.

Last year, on returning with Mr. G. P. Whitley from Michaelmas Cay, off Cairns, North Queensland, circumstances necessitated a couple of days interval, which comparatively might have been wasted in Brisbane. Instead we decided to run down to Caloundra and review the outlook again. Although the weather was unpropitious we were well rewarded for our pains, as we secured some nice things, while the place justified all encomiums after our experience on the Great Barrier Reef. We met there an ardent shell collector, Mr. C. H. Nicholson, who has since handed us some interesting specimens.

Miss Joyce K. Allan, of the Australian Museum, has painted the beautiful figures here presented, and which almost make verbal descriptions unnecessary. My thanks are sincerely given here, as they make the recognition of my records easy to everyone.

The types of the new species here described are in the Australian Museum.

ANADARA NICHOLSONI, n.sp.

Plate xlv., figs. 6, 13.

Although Arks have been recorded with world-wide distribution, this conclusion does not harmonise with the data provided by series from many localities. A few species do appear to have a wide range, but closer examination reveals separate characters of good value, and these are usually associated with geographical limits.

The species hereunder described recalls *A. pilula* Reeve, from which it is separated by its larger size, much greater solidity, and its hinge teeth.

Shell medium, very solid, rather orbicular, oblique, obese, umboes rather distant, lozenge area pronounced, hinge teeth comparatively few and strong. Color of dead-shell white. Sculpture consisting of twenty-five strong radial ribs with deep interstices, the ribs closely nodulose, the interstices faintly striate, concentrically with growth lines. The hinge-line is short, the median hiatus ill marked; on one side about twenty teeth, including half a dozen large irregular ones at the end; on the other side about twelve teeth with four large somewhat angulate teeth at the end.

Length, 33 mm.; height, 39 mm.

A dead shell collected by Mr. C. H. Nicholson at Caloundra.

The hinge-line of *A. pilula* Reeve is here figured from a specimen from Yeppoon, Queensland. (Plate xlv., fig. 14).

ANADARA THACKWAYI, n.sp.

Plate xlv., figs. 4, 5.

While on the subject of Arks, I take this opportunity of describing a strange New South Wales species first found by Mr. A. E. J. Thackway, for whom it is named. The first specimens were picked up on the beaches between Port Jackson Heads and Port Hacking, one valve at Cronulla the other at Maroubra. During the last four years Mr. G. P. Whitley has found five more valves at long intervals on the Maroubra beach, while I have searched continuously in vain the beaches north of the Port Jackson Heads, though, as the species is a relative of the northern tropical *A. granosa*, it would be expected there first.

The new species agrees with *granosa* in general features, but is easily separated by the distant nodulation of the ribs, smaller size, finer hinge-teeth, and approximation of the beaks. Shell suborbicular or semioval, deep, regularly ribbed, beaks oblique, a little excentric, approximating, lozenge area narrow.

Color of dead shells cream to chalk. Sculpture consisting of about twenty-one elevated distant ribs, each bearing about seven to nine prominent nodules, the earlier ones becoming obsolete: the deep wide interstices finely striate. The hinge-line shows fine longitudinal teeth, scarcely larger at the ends, but with a distinct hiatus in the middle below the beaks, where a couple of larger oblique teeth occur; on one side twenty-five teeth can be counted, on the other fifteen only: in the tropical *granosa* thirty and twenty teeth respectively occur.

Length, 26 mm.; height, 18 mm.

A strange aberration, more elongate and with more and closer nodulation also occurred, and is here figured. Length, 30 mm.; height, 24 mm.

STREPTOPINNA SACCATA INUSITATA, n. subsp.

Plate xlv., figs. 9, 10, 11.

An extraordinary mollusc, suggesting a cross between an *Avicula* and a *Pinna*, was found at Michaelmas Cay, North Queensland, and immediately recognised by Mr. Hedley as a form of *Pinna saccata* L., a species previously unrecorded from Australia. A couple of larger specimens were later secured, but to our great surprise a larger valve was found at Caloundra. This showed the muscle scars to be very small, and is here figured. These scars approximate much more closely to those of *Atrina* than to those of *Pinna*, and obviously indicate the species as generically distinct.

When Martens reviewed the Pinnae (Ann. Mag. Nat. Hist. (3) xvii., February, 1866, 81-88) he noted the distinction of the species, and suggested habits, but gave the group no name. Without further information he introduced *Streptopinna* (Beitrag meeresf. Mauritius (Möbius), 1880, 318) some years later for this species alone.

Apparently this species lives among corals and has adopted strange shapes to get around the branches, as when it has struck easy ground it grows comparatively straight as the Caloundra one has done.

The Queensland form is easily separated from the type in its different colouration, pale horn instead of amber-red, its more regular sculpture, five flattened distinctly separated ribs being counted, a sixth and seventh occurring in aged shells, and noticeable smooth area.

PRATULUM PROBATUM, n.sp.

Plate xlv., fig. 8.

Some years ago Hedley (Proc. Linn. Soc. N.S.W., 1904, 195, May 10th) recorded *Cardium bechei* Reeve, from the Tweed Heads district, New South Wales, previously only known from Queensland in Australia. Many valves were present on the Caloundra beaches and they were found to disagree in shape and sculpture from the true *C. bechei*, and are therefore here differentiated. Shell large, thin, nearly orbicular, somewhat obese, medially and anteriorly very finely radiately rayed, almost smooth, posteriorly boldly closely ridged. Colouration rose-pink flecked with white: internally pure white. The hinge-teeth agree with those of the type of *Pratulum*, suggesting tropical origin for the group. The radials on the anterior portion are very numerous and fine and are crossed by similar concentric growth lines, almost imperceptible in the juvenile, but odd ones are marked as growth stops: these become more pronounced with age, so that an old senile shell may show a series of step-like stages. Moreover, the periostracum is laid down in accordance, and, if present, shows a beautiful concentric arrangement. The posterior radials also bear very pronounced prickles in the living shell, but apparently these are easily worn off as they

are seldom seen in the dead shells. These posterior radials number about twenty-seven and to the edge of the shell: though no noticeable radials persist on the medial and anterior portion of the shell; the edge is strongly and similarly closely toothed.

The figured shell is a small specimen from Trial Bay, New South Wales, measuring 30 mm. broad and 28 mm. high. A perfect specimen from the Percy Islands, Queensland, measures 46 mm. in breadth, 44 mm. in height, and the conjoined valves 36 mm. A huge valve from the Tweed River Heads, New South Wales, measures 78 mm. in height, and 81 mm. in breadth.

MARINAURIS MELCULUS, n.sp.

Plate xlv., fig. 3.

Shell small, flattened, somewhat circular, spire a little elevated, closely related to *Haliotis brazieri* Angas, but easily separated by the presence of cording between the orifices and the basal rim. Colour pale greyish brown, flamed with brown and red. A fine radial sculpture crosses a close spiral sculpture of flattened lirae producing an obsolete reticulation which decreases with growth: a raised medial concentric rib is present.

The orifices are close together and upstanding, while between these and the peripheral ridge lie four concentric corded ribs; between the periphery and the callus four ridges occur, this area being convex. Columellar plate wide and flat. Internal colouration silvery: all whorls exposed.

Length, 33 mm.; breadth, 29 mm.

Broken specimens not uncommon at Caloundra.

Hedley (Proc. Linn. Soc. N.S.W., Vol. xxix., 1905, April 12, 1906, 521) observed that "It further seems to me that *H. rubicundus* Montfort, should replace the later *H. tricostralis* Lamarek. Montfort's name, which Pilsbry marked as very doubtful, was recognised and accepted by Dr. J. E. Gray, who had unusual facilities for ascertaining the facts of the case." This conclusion was revised (i.e., xxxiii., 1908, 464) on the grounds that *rubicundus* Montfort was preoccupied by Bolten and that *scalaris* Leach should be used. However, Montfort's *Padollus rubicundus* was the monotype of *Padollus*, and it appears to have been overlooked that Montfort described from Africa a small shell a little more than an inch at its greatest diameter, and the good description and figure are both inapplicable to the Australian shell. Further there lives in South Africa a shell which agrees in size and description with the Montfortian species, known as *Haliotis parva* Linn. Bolten's *H. rubicundus* (Mus. Bolt. (2), 1798, 14) was cited by Hanley as referable to the Linnean *parva*, so that *Padollus* must be restricted to the African species.

I therefore introduce *Marinauris* for the Australian forms commonly regarded as *Padollus*, but would note that when Pilsbry monographed these molluscs (Man. Conch., Vol. xii., 1890) he placed *brazieri* in a section under *Padollus* while he located *roei*, of which he incorrectly made *hargravesi* a synonym, alongside *naevosa* under *Haliotis*.

MARINAURIS ETHOLOGUS, n.sp.

Plate xlv., fig. 1.

Shell small, flattened, somewhat circular, closely related to *H. hargravesi* Cox, but differing at sight in the more numerous cords in this respect recalling the West Australian *H. roei* Gray, than which it is smaller, more circular and with finer sculpture.

On the last whorl between the suture and the orifices seventeen ribs of unequal width: between the orifices and the periphery three similar ribs, and between the periphery and the silver callus six or seven minute elevated ridges occur. The preceding whorl shows nine main ribs or cords, the number increasing by intercalation: all the ribs are square-cut, the interstices deep, both ribs and interstices crossed by numerous closely packed very marked threads.

The interior silvery, clearly showing the preceding whorls. Between the orifices and the columellar callus, which is wide and flat, the area is convex and corded; above the peripheral ridge are three distinct pronounced corded ribs.

Length, 41 mm.; breadth, 31 mm.

Broken specimens rare at Caloundra.

H. hargravesi Cox is the rarest of Australian Haliotids, but is apparently widely distributed in deeper water from north of Sydney to Twofold Bay. *H. brazieri* Angus has the same distribution, but is much more common at certain localities, Mr. G. McAndrew having collected large series on the beach at Shell Harbour, N.S.W.

PHASIANELLA CALOUNDRÆ, n.sp.

Plate xlv., fig. 12.

Shell small, elongate oval, spire acute, whorls slightly rounded, sutures distinct, whorls seven, imperforate.

Colour creamy brown, circled with brown lines which are dotted with white and longitudinally flamed with brown in zigzag fashion; numerous variations of this colour scheme occur. Apical whorls minute, flattened; shell entirely smooth, but a microscopic spiral striation can be discerned with a glass; aperture ovate, about half the length of the shell: columella reflected and callused, the callus crossing to the posterior angle of the aperture; outer lip thin, sharp. Operculum normal, white, with a faint yellowish tinge medially.

Length, 15 mm.; breadth, 9 mm.

Abundant at Caloundra.

Very like the southern *P. variegata* Lam., but different from the N.S.W. form.

NANNOCASSIS TORVA Iredale.

Plate xlv., fig. 7.

Shell large for the genus, spire depressed, almost planate, apical whorls a little elevated, shell somewhat triangularly ovate, variced, mouth narrowed. Early whorls worn, five remaining ones distinguishable, the earliest of these showing sculpture worn and not definitely determinable, the next flattened with about twenty-two angulate nodules at periphery, an obscure varix apparently completing the whorl, revolving lirae becoming noticeable: these are better marked on the next whorl where two or three may be seen on the lower half, the nodules also being better marked as riblets, while two varices may be observed: on the antepenultimate whorl the same sculpture becomes bolder and a varix is marked at three-fourths the length of the whorl. On the last whorl the periphery is angulate, seminodulose, the flattened shoulder bearing slanting radials, the spirals having become obsolete: below the shoulder is a slight depression followed by another seminodulose ridge and thence to the base longitudinal ridges to the number of about thirty occur between the preceding varix, three-quarters of a whorl back and the outer lip: fairly strong spirals, twenty-five to thirty in number, lattice the ridges: this sculpture is much emphasised on the face of the body whorl where it is heightened by a clear glaze from the

inner lip. The inner lip is closely and strongly wrinkled, the ridges running backwards on the upper half and forwards on the anterior portion. The canal is short, recurved, and bounded posteriorly by a very deep narrow gutter running into the umbilical sector which is closed by the varix and the reflection of the inner lip anteriorly: above the gutter is a rounded collar succeeded by a narrow sulcus. The deep gutter continues interiorly under the glaze as in *Nannocassis nana* T. Wds., while at the posterior end of the inner lip appears a well marked ridge forming with the outer lip a posterior canal recalling that of *Cypraecassis*. The outer lip is reflected and the varix flattened, medially spreading internally: strong distant ridges are present along the interior edge, about thirteen in number with five intercalating in the middle but not entering the mouth.

Length, 67 mm.; breadth, 38 mm.

This distinct species based upon a dead shell collected by Mr. C. H. Nicholson is easily separated from *N. nana* T. Wds. by its larger size and complex sculpture.

This makes the eleventh species of Cassid found on the beach at Caloundra, a number probably unsurpassed on any other beach in the world.

The present species was diagnosed but not fully described nor figured in "A Review of Australian Helmet Shells," published in the Records Austr. Mus., Vol. xv., 1927, 329.

AMORIA GROSSI, n.sp.

Plate xlv., fig. 2.

Shell large, oblong oval, spire short, acuminate, smooth. Colour of dead shell pale cream, mottled and streaked with pale brown, the mottling forming two irregular interrupted bands. The spire is about half the length of the aperture.

The columella has four oblique plaits with a noticeable nodule at the posterior end, from some angles looking like a fifth plait. Interior of aperture white with about a dozen lines internally.

Length, 118 mm.; breadth, 48 mm.

Collected at Caloundra by Mr. G. Gross.

This specimen was named as new and the above name attached in MS. by Mr. Hedley, and is now published. The species differs in size and solidity, as well as colouration from any other of the *volva* group.

EXPLANATION OF PLATE.

- Fig. 1. *Marinauris ethologus* Iredale, type.
 2. *Amoria grossi* Iredale, type.
 3. *Marinauris melculus* Iredale, type.
 4. *Anadara thackwayi* Iredale.
 5. *Anadara thackwayi* Iredale, type.
 6. Hinge of *Anadara nicholsoni* Iredale, type.
 7. *Nannocassis torva* Iredale, type.
 8. *Pratulium probatum* Iredale, type.
 9. *Streptopinna saccata inusitata* Iredale.
 10. *Streptopinna saccata inusitata* Iredale, from Caloundra.
 11. *Streptopinna saccata inusitata* Iredale, from Caloundra.
 12. *Phasianella caloundra* Iredale, type.
 13. *Anadara nicholsoni* Iredale, type.
 14. Hinge line of *A. pilula* Reeve, from Yeppoon, Queensland.

CRITICAL REMARKS ON *PACHYNERES AUSTRALIS* MALLOCH; AND ITS POSSIBLE IDENTITY WITH *BIBIONIDAE*.

By G. H. HARDY,

Walter and Eliza Hall Fellow in Economic Biology, Queensland University, Brisbane.

Dr. E. W. Ferguson and Mr. F. H. S. Roberts have requested my opinion of Malloch's species *Pachyneres australis*, and there are others interested who have puzzled to account for such an abortive form of Bombyliid as Malloch's description would convey to the average entomologist: moreover it is beginning to dawn upon many of us that a mistake has been made in allying the fly to the family. I have withheld expressing my own doubts upon the matter, awaiting the accumulation in various collections of more forms of BOMBYLIIDAE, but since the description was published only one new species has arrived showing outstanding characteristics, this being a Western Australian form that bears a strong resemblance to the TABANIDAE. In offering the following views now, I do so with the object of turning the attention of investigators to the NEMATOCERA wherein, perhaps, further specimens of *Pachyneres australis* Malloch may be found.

This fly, reputed to be a Bombyliid and represented by one specimen presumably somewhere in America, was found by Malloch in a box containing bits of flowers and many hundreds of insects, evidently sweepings gathered at Como, New South Wales. The material had already been sorted by Dr. C. F. Baker for HOMOPTERA at least once, the remainder being forwarded from Fiji to the States (see Malloch, Austr. Zool., iii., 1924, p. 205).

Even on the incredible assumption that the fly so found did not suffer the loss of any appendages, the identity of a specimen only 1.5 mm. in length may not have been convincingly ascertained, so not only would I question the family alliance of the specimen but also the possibility of the highly specialised *Pachyneres* occurring in such widely separated zoogeographical regions as represented by North America and Australia without an intermediate connection and without evidence of a closer zoological affinity between these regions. One can readily recognise the alliance of the typical *Pachyneres* with the North American BOMBYLIIDAE as the venation seems to show some connection with the genus *Mythicomylia*, but there is no Bombyliid known in Australia that appears related even in a remote way.

Como, the type locality, is a favourite hunting ground for insects and one that I have visited myself on several occasions, but no Bombyliid has been found there or elsewhere to conform to any characters given by Malloch. Moreover, Malloch mentioned several distinguishing features between the 'American and Australian forms, one being the antennae which had the third segment more tapering and without a discernible thimble-like process at the tip. Doubtless other differences could be found if looked for and amongst them some important ones that may give a clue to the family, for none such is to be found in Malloch's account.

I have carefully considered the diagram of the wing given with the description to study from this aspect where else the insect may be placed. The veins in and near the anal area being reduced suggests a NEMATOCERA and a careful comparison with leading features in this section suggested further either of two families both having a median cell or one approximating thereto, namely, RHYPHIDAE and BIBIONIDAE. Illustrations of *Obligaster*, one of the former

family, gave the venation with two veins running together to form a triangular area just above the first basal cell but the long antennae of that genus would prohibit this alliance.

I have searched my collection of BIBIONIDAE for one that would approximate the venation of *P. australis* and found a truly remarkable similarity but in no case was a small triangular cell referred to present. I have yet other specimens of *Nematocera*, some have the small cell but all the forms so provided have elongate antennae and in none is to be found anything to represent a median cell.

From the very meagre knowledge to be gained from Malloch's account there is little to suggest that the insect is not a Bibionid, and there is much to suggest that it is not a Bombyliid. Arguments in favour of it being a Bibionid are:—

1. The general type of wing structure, the triangular cell only being missing on the forms examined.
2. Small size.—My smallest Bibionid is 3 mm. long; and the Bombyliid 4 mm. or over.
3. Black and yellow colour—these being the only ones found on the *Bibionidae*.
4. A female with a wide front narrowing towards the antennae,—when the wide front occurs on the Australian BOMBYLIIDAE it narrows towards the ocelli.
5. Proboscis small, hardly exerted.—The mouth parts are mainly inconspicuous on some of the BIBIONIDAE and so if the palpi on the type are broken off, which is quite likely to be the case, this character would seem to fit.

The one outstanding character that makes me hesitate before offering these remarks as an undoubted solution to the identity of that supposed Bombyliid is in the nature of the ocellar tubercle. This is remote from the eyes on all Bibionids examined whilst on *P. australis*, according to the description, it is approximate to them.

FISHERMEN VERSUS SEALS.

There has recently appeared in the Melbourne "Argus" some correspondence on the subject of seals destroying fish and crayfish-pots, the professional fishermen loudly denouncing the seals as pests which are rapidly ruining the fishing industry by their depredations. While in Western Australia in 1921 I heard similar complaints against the seals in the Recherche Archipelago, and it was stated that the fishermen waged a determined war on the unfortunate mammals. It seems to be the old story of the dog and the bad name, for better qualified observers consider that the seals are not the chief offenders.

Sir James Barrett writes in defence of the seals, quoting from a statement made by an experienced fisherman, who considers the seals "at times somewhat of a nuisance, but not to the extent indicated. . . . They are not keen fishers, as if they were they would immediately deal with the fish in the vicinity. Right round the rocks where they live is one of the best fishing grounds in Western-port. There are thousands of slow swimmers, gurnard, bluehead, and parrot fish. He has caught these fish with the seals swimming around the boat, but he has never lost one of the hooks from the seals. He has been crayfishing for a great number of years, and during this period he has not had more than half a dozen seals in the crayfish pots, and they were puppy seals which got in and could not get out, and were invariably dead."

A. F. Basset Hull.

A MONOGRAPH OF THE AUSTRALIAN LORICATES.

(Phylum MOLLUSCA—Order LORICATA.)

By TOM IREDALE and A. F. BASSET HULL.

IX.

APPENDIX C.

BIOGRAPHY AND BIBLIOGRAPHY.

Note:—The following abbreviations are used in this Appendix:—

S.A.—Transactions of the Royal Society of South Australia.

Tas.—Papers and Proceedings of the Royal Society of Tasmania.

Vic.—Proceedings of the Royal Society of Victoria.

W.A.—Journal and Proceedings of the Royal Society of Western Australia.

P.L.S., N.S.W.—Proceedings of the Linnean Society of New South Wales.

A.A.A.S.—Report of the Australasian Association for the Advancement of Science.

ADAMS, Arthur.

Born at Gosport, Hants., England, 1820, died 1878. Famous English conchologist, who was a naval surgeon and made large collections in the Eastern seas while on service, making beautiful paintings of living animals. With his brother Henry he wrote a standard work, "Genera of Recent Mollusca," wherein a good general account of the groups of Loricates appears. Previously he had described two Sydney Loricates:—

"Descriptions of New Shells from the Cumingian Collection," P.Z.S., 1852, 91-2. *Chiton muricatus*, Sydney (Strange), *C. versicolor*, do., do.

With his brother he proposed the genus *Lorica*:—

"On a new genus of Chitonidae," Ann. Mag. Nat. Hist. (2), ix., 1852, 355. Type *L. cimolia* = *Chiton cimolius* Reeve.

ADAMS, Henry.

Elder brother of preceding, an architect by profession, born 1813, died 1877. Described a new subgenus and species of Australian *Loricata*:—

"Descriptions of some New Genera and Species of Shells, from the Collection of Hugh Cuming, Esq." P.Z.S., 1861, 385. *Notoplax*, *Cryptoplax* (*Notoplax*) *speciosa*. Tasmania.

Collaborated with G. P. Angas (q.v.) in the description of the following shells:—*Lepidopleurus variegatus*, *L. speciosus*, *L. liratus*, *Stenochiton juloides*, *Lorica angasi*, *Chaetopleura conspersa*, *Acanthochites costatus*, *A. carinatus* (not Australian), *Hanleya variabilis*, *Microplax grayi*. "Description of New Genera and Species of Chitonidae from the Australian Seas, in the collection of George French Angas." P.Z.S., 1864, 192-194.

In the following year Angas, in connection with other mollusks figured *Stenochiton juloides* and *Microplax grayi*.

ANGAS, George French. (Plate xlvii.).

Born at Dawlish, Devonshire, England, April, 1822. In 1843 he visited South Australia and New Zealand. In 1851 he was secretary of the Australian Museum, Sydney. He subsequently returned to England, and died October 8, 1886. He collected shells enthusiastically in South Australia and New South Wales, publishing good accounts after his return to England, and providing a basis for local workers. He had the honour of collecting the still unique *Chorioplax grayi* in Sydney Harbour sixty years ago. He listed the South Australian Loricates (P.Z.S., 1865, 186) totalling fourteen species, later adding two more

(P.Z.S., 1878, 860). From New South Wales he recorded a larger fauna of twenty-three species, describing three as new, viz.:—*Lophyrus smaragdinus*, *Onithochiton rugulosus*, and *Tonicia carpenteri* (the lastnamed apparently is not from New South Wales). On p. 222 *Chiton carnosus* ex Carpenter MS. was recorded.

ASHBY, Edwin. (Plate xlvii.).

Born at "Plaistow," near the village of Capel, Sussex, England, November 2, 1861. Emigrated to South Australia in October, 1884. A keen collector of Loricates and a voluminous writer. He has personally collected in Western Australia from near Cape Leeuwin north to Geraldton; South Australia from near the Murray mouth westward to Venus Bay in the Great Australian Bight; Victoria in Port Phillip, Port Fairy, Warrnambool, Portland, Phillip Island, and Western Port; Tasmania, Derwent Estuary to Bruny Island, D'Entrecasteaux Channel, North-west Coast from Port Sorell to Robbins Island; New South Wales, Port Jackson and Port Stephens. He possesses a large collection of Australian and exotic Loricates, including that made by Major Dupuis.

He has proposed the following new genera:—*Kopionella* (1919), *Zostericola* (1919), *Lophochiton* (1923); and named the following forms:—*Ischnochiton atkinsoni lincolnsensis*, *I. a. brunensis*, *I. auratus*, *I. (Heterozona) properensis*, *I. (H.) cariosus* var. *occidentalis*, *I. (Haploplax) smaragdinus* subsp. *resplendens* var. *westernensis*, *I. (H.) misimaensis*, *I. (H.) mayi* var. *viridis*, *I. (Stenochiton) pallens*, *Stenochiton posidonialis*, *S. cymodocealis*, *S. tatei*, *Lepidopleurus profundus* (not May), *Callochiton rufus*, *C. platessa* var. *fossa*, *C. klemi*, *Callistochiton antiquus meridionalis*, *C. a. mayi*, *C. gatliifi*, *Lophochiton johnstoni*, *Loricella torri*, *Kopionella tasmanica*, *K. matthewsi* var. *intermedia*, *Acanthochiton bednalli* var. *johnstoni*, *A. macrocystialis*, *A. thackwayi*, *A. gatliifi*, *A. shirleyi*, *A. marillaris*, *A. pilsbryi maughaneanus*, *A. retrojectus* var. *pustulosus*, *A. kimberi yallingupensis*, *A. (Notoplax) spongialis*, *A. (N.) spongialis glauerti*, *A. (N.) gabrieli*, *A. mayi*, *Notoplax porcina*, *Craspedochiton jaubertensis*, *Chorioplax grayi pattisoni*, *Cryptoplax iredalei*, *Rhyssoplax torrianus* var. *klemi*, *R. geraldtonensis*, *R. jacksonensis*, *Sypharochiton pellisserpentis* subsp. *septentriones*, *Acanthopleura gemmata queenslandica*, *A. spinosa* var. *montebelloensis*. With Hull:—*Ischnochiton iredalei kingensis*. Fossil genera:—*Protochiton*, *Afossochiton*, *Protolorica*, *Pseudoloricella*, and species:—*Lepidopleurus magnogranifer*, *Afossochiton cudmorei*, *Acanthochiton chapmani*, *Lorica cudmorei*, *Protolorica atkinsoni*, *Loricella sculpta*. With Torr:—*Lorica compressa*, *L. affinis*, *Loricella gigantea*, *Plaxiphora concentrica*, *P. gellibrandi*, *Acanthochites (Notoplax) granulatus*, *A. rostratus*, *Chiton fossicius*, *C. paucipustulosus*.

In addition to two papers written in collaboration with Torr (q.v.), he has published the following papers relating to Loricates:—

1900. Definitions of Two New Species of South Australian Polyplacophora. S.A., xxiv., 86-88, pl. i.
1901. Fossil Polyplacophora from Eocene Beds of Muddy Creek, Mornington (Schnapper Point) and Moorabool, Victoria, with Definitions of Nine New Species, and Notes on Others. S.A., xxv., 136-144, pl. iv. (With W. G. Torr).
1918. Review of the Australian Representatives of the Genus *Ischnoradsia*. S.A., xlii., 62.
- . Monograph of the Genus *Stenochiton* (Order Polyplacophora) with Descriptions of Two New Species. S.A., xlii., 65-78, pls. xiii., xiv.
- . Notes on South Australian Polyplacophora, with Additions to the Fauna;

- together with a List of Australian Polyplacophora, showing their Distribution in the Australian States. S.A., xlii., 79-87.
1919. A Review of the Genus *Loricella* (Order Polyplacophora), with Notes on Features Previously Unnoted and Description of a New Species. S.A., xliii., 59-65, pl. x.
- . Notes on Australian Polyplacophora, including Descriptions of Two New Genera, a New Variety, and the Description and proposed recognition of Mr. Bednall's *Stenochiton Pilsbryanus*. S.A., xliii., 66-73, pl. xi.
- . Descriptions of Six New Species of Australian Polyplacophora (four *Acanthochitons* and two *Callistochitons*), with other Notes. S.A., xliii., 394-404, pls. xli., xlii.
1920. The Occurrence of Three Species of *Stenochiton* in Western Australia. W.A., vi., 108-111.
- . Chitons of the D'Entrecasteaux Channel, Southern Tasmania, including additions to the Tasmanian Fauna, and Descriptions of a New Species and a New Variety. S.A., xlv., 263-271, pl. xi.
- . A Review of *Chiton crispus*, Reeve (Order Polyplacophora) and its Allies, with proposed recognition of Blainville's *Chiton lineolatus*, and Description of Three New Species. S.A., xlv., 272, pl. xi.
- . Further Notes on Australian Polyplacophora with Additions and Corrections of the 1918 Distribution List. S.A., xlv., 283-292.
- . Description of Bracebridge Wilson Collection of Victorian Chitons, with Description of Two New Species. Vic., 33 (N.S.), 149-159, pl. viii.
1921. Notes on some Western Australian Chitons (Polyplacophora), with Additions to the Fauna and the Description of a New Species of *Rhyssoplax*. S.A., xlv., 40-49, pl. viii.
- . Description of a New Species of Fossil *Loricella* (Order Polyplacophora), with Remarks on Some Undescribed Characters present in *Loricella angasi*, Ad. and Ang., and *L. torri*, Ashby. Tas., 1921, 37-40, pl. xv.
- . The Rediscovery of *Chorioplax* (= *Microplax*) *grayi*, Adams & Angas (Order Polyplacophora), with Notes on its True Place in the Natural System and the Description of a New Sub-species. S.A., xlv., 136-142, pl. ix.
- . Notes on the Australian Representatives of the Genus *Acanthopleura*, Guilding, together with a Description of Polyplacophora in the Western Australian Museum. W.A., viii., 29-34.
1922. Notes on Australian Polyplacophora, with Descriptions of Three New Species and Two New Varieties. S.A., xlv., 9-22, pl. iii.
- . Types of Species of Australasian Polyplacophora described by De Blainville, Lamarek, De Rochebrune, and others, now in the Muséum D'Histoire Naturelle, in Paris. S.A., xlv., 572-582.
1923. A New Species and Sub-species of *Acanthochiton*. W.A., x., 13-16, pl. i.
- . Notes on the Genus *Stenochiton* and the Discovery and Recognition of the Type of Blainville's *Chiton longicymba* in *Stenochiton juloides*, Adams & Angas. Proc. Mal. Soc. (Lond.), xv., 261-265.
- . The Polyplacophora of King Island, Bass Strait, with Description of a New Sub-species. Aust. Zool., iii., 79-84, pl. viii. (With Hull).
- . Monograph on the Australian Lepidopleuridae (Order Polyplacophora) with a Description of a New Species. S.A., xlvii., 216-223, pl. xvi.
- . A Review of *Ischnochiton* (*Haploplax*) *smaragdinus*, Angas, 1867, and

- its Congeners, together with a Description of Two New Chitons from Papua. S.A., xlvii., 224-229, pls. xvi., xvii.
- Notes on a Collection of Polyplacophora from Carnarvon, Western Australia, with Definitions of a New Genus and Two New Species. S.A., xlvii., 230-236, pls. xvi., xvii., xviii.
- A Review of the Australian Representatives of the Genus *Cryptoplax* (Order Polyplacophora). S.A., xlvii., 237-243, pl. xix.
1924. The Chiton Fauna (Polyplacophora) of Port Stephens, New South Wales. S.A., xlviii., 313-322, pl. xxxi.
- Further Notes on Australian Polyplacophora with Descriptions of Three New Species. S.A., xlviii., 323-327, pl. xxxi.
- Notes on the Types of Australasian Polyplacophora in the British Museum. S.A., xlviii., 328-333.
1925. The Regional Distribution of Australian Chitons (Polyplacophora). A.A.A.S., xvii., 366-393, map.
- Monograph on Australian Fossil Polyplacophora (Chitons). Vic., xxxvii. (N.S.), 170-205, pls. xviii., xxii.
1926. The Acanthoid Chitons of New Zealand with Descriptions and Figures, including several New Species. Proc. Mal. Soc. (Lond.), xvi., 6-35, pls. i., iv.
- Victorian Chitons. Vic. Nat., xliii., 7-16, pl. i.
- Ecological Notes and Descriptions of previously unrecorded Features of *Onithochiton ashbyi*, B. & M., *Acanthochiton crocodilus*, T. & A., together with Definitions of a New *Callochiton* (Polyplacophora). S.A., I, 241-244, text-fig.
1927. Notes on, and Additions to, the Chiton Fauna of North-west Tasmania, together with a Brief Review of the Genus *Stenochiton*. Tas. (1926), 92-117.
- Further Notes on Victorian Chitons. Vic. Nat., xliii., 356-358.

ATKINSON, Edwin Dresser.

A resident of the north-west coast of Tasmania, who collected fossils from the Table Cape beds, and after whom *Loricella atkinsoni* was named. Died 1920.

ATKINSON, Richard N.

Son of the foregoing, and a keen collector of Loricates, after whom *Ischnochiton atkinsoni* was named. Died 1915.

BEDNALL, William Tompson. (Plate xlv.).

Pioneer collector of Australian Loricates in recent years, in connection with E. H. Matthews (q.v.). Born at Leicester, England, in August, 1838; died at Adelaide, South Australia, July 25, 1915. His historic paper, "The Polyplacophora of South Australia" (Proc. Mal. Soc. (Lond.), 1897, 139-159, pl. xii.) was based on Pilsbry's Monograph, and with the assistance of the American master, much of the material being collected by Matthews. In it were described *Ischnochiton tateanus*, *I. pilsbryi*, *I. (Stenochiton) pilsbryanus*, *I. thomasi*, and *Chiton exoptandus*. Later, in collaboration with E. H. Matthews, Bednall published a paper "On New Species of Polyplacophora from South Australia" (Proc. Mal. Soc. (Lond.), vii., 1906, 91-92, pl. ix.) describing *Ischnochiton resplendens*, *Lepidopleurus matthewsianus*, *Chiton aureomaculata*, and *Onithochiton ashbyi*. Pilsbry named *Chiton bednalli* and *Acanthochiton bednalli*, Thiele *Platiphora bednalli*, and Torr *Ischnochiton bednalli* in his honour. In 1875 Bednall privately printed at Darwin, Northern Territory, where he then resided, a List of South Australia

lian Shells; in 1893 Adcock privately printed another, and in 1908 Verco privately printed a third, but no list of South Australian Shells has been published. Bednall also published "Notes on some Tasmanian Chitons" (Tas., 1895, 34-39) an item which was overlooked by Iredale and May in their account.

BELL, Roy. (Plate xlvii.).

Born at Sunday Island, Kermadec Group, February 19, 1882. A well known naturalist who collected at Lord Howe and Norfolk Islands, Port Fairy and Mallacoota, Victoria, and Twofold Bay, New South Wales. *Cryptoplax royana* Iredale & Hull was named after him.

BLAINVILLE, Henri Marie Ducrotay de.

Born 1777, died May 1, 1850. Famous French malacologist, who wrote a *Traité de Malacologie*, and in the preparation of this became interested in the numerous species of Loricates preserved in the Paris Museum from the collections of Peron and Lesueur, and Quoy and Gaimard in Australia. He wrote a complete account, describing many new species. Although the descriptions were well written for the period they are now difficult to interpret, but many of the actual specimens described are still preserved. However, owing to the fact that the collections were mixed, and the shells have since been handled by many incompetent workers, great difficulty still persists. It may be noted that no specimens were marked "type" by Blainville, as has been asserted by a recent worker, the term "type" not coming into use in such a connection until some twenty years after Blainville wrote his descriptions.

Blainville proposed the genus *Cryptoplax* and the species *Cryptoplax larviformis* (Dict. Sci. Nat. (Levrault), xii., 1818, 124). In the same publication (xxxvi., 1825, 541, et seq.) he named *Chiton elongatus*, *C. lineolatus*, *C. longicymba*, *C. sueurii*, *C. vermiformis*, *C. costatus*, *C. albidus*, *C. hirtosus*, *C. gaimardi*, and *C. gemmatus*. Many species were recorded by him as from Australia which have not yet been identified; possibly the locality is erroneous. Such are *Chiton tectum*, *C. clypeus*, *C. multimaculatus*, *C. testudinarius*, and *C. elegans*.

For an account of Blainville's troubles regarding the publication of his Loricata work see Proc. Mal. Soc. (Lond.), xi., 1914, 128.

BRACEBRIDGE-WILSON, J.

Master at Geelong Grammar School, Victoria. Born 1828, died October 22, 1895. Dredged for many years in Port Phillip, Victoria, and his Loricates provided E. R. Sykes (q.v.) with the opportunity of listing the Victorian species soon after the publication of Pilsbry's Monograph. Sykes named *Acanthochiton wilsoni* and *Ischnochiton wilsoni* in his honour.

BRAZIER, John. (Plate xlvii.).

Born at Sydney, New South Wales, September 23, 1842. One of the greatest of Australian shell collectors, still living. Although he secured almost every New South Wales species of Loricata, including *Delicatoplax translucens* and *Parachiton puppis*, in the early days (1860-70) of his collecting, he did not describe them. He recorded the Loricates collected during the "Chevert" Expedition (Proc. Linn. Soc. N.S.W., ii., 1877, 75) including *Chiton pulcherrimus* from Darnley Island, Torres Strait, this shell being described in this Monograph as *Rhyssoplax excellens*.

BRODERIP, William John.

Born 1789, died 1859. Famous British Malacologist who published the name

Oscabrella, a latinisation of Lamarck's *Oscabrelle*, the vernacular suggested for *Cryptoplax* (British Cyclopaedia, ii., 1836, 31).

BRUGUIERE, Jean Guillaume.

Born 1750, died 1799. Wrote the *Conchology* in the *Encyclopedie Methodique*, which was left unfinished owing to his death during the French Revolution. He had the honour of describing the first Australian Loricata, *Chiton spinosus* (Journ. d'Hist. Nat., Paris, i., 1792, 25).

BURROW, Edward John.

A British minister, born 1785, died 1861, who published a little work entitled "*Elements of Conchology*," which ran into three editions. In this two strange Loricates were figured, and he introduced a MS. generic name given by Blainville, *Cryptoconchus* (this being the earliest division of the Linnean genus *Chiton* (1815)), and described *Chiton larvaeformis*, and *C. spinosus*.

CARPENTER, Philip Pearsall.

Born at Bristol, England, November 4, 1819, died at Montreal, Canada, May 23, 1877. The most meticulous of conchologists, he took up the intensive study of Loricates and amassed a huge manuscript. Dall, who had latterly worked with Carpenter, after his death published a resumé based upon the manuscript, and Carpenter's scheme was partially adopted. The work was never completed by Dall, and when some years later Pilsbry, in continuing Tryon's *Manual of Conchology*, reached the group Dall placed the MSS. at Pilsbry's disposal. The monumental work prepared by the latter owed a great deal to Carpenter's notes, full use of his MS. descriptions of British Museum specimens being made and credited to Carpenter. Such well known names as *Heterozona*, *Ischnochiton cariosa*, in use, and many not at present used, such as *Macandrellus*, were proposed by Carpenter. Angas named *Tonicia carpenteri* in his honour.

CARTER, Thomas.

Well known Australian ornithologist who collected some Loricates in Western Australia, and after whom *Squamopleura carteri* was named.

COPPINGER, Dr. Richard William.

Naturalist on the "Alert," collected Loricates at Sydney, Port Curtis, and Port Molle, Queensland. These were described by E. A. Smith (q.v.) who named *Chiton coppingeri* in his honour.

COX, Dr. James Charles. (Plate xlvii.).

Born at Mulgoa, New South Wales, 1833, died at Sydney, September 29, 1912. Famous Australian conchologist, who through the publication of Pilsbry's *Monograph* took a great interest in Loricates. He made a large collection, sending specimens to Pilsbry, who described the new species, naming *Chiton coxi*, and *Acanthochiton coxi*. Cox also sent a series to the British Museum, and listed the Port Jackson Loricates (P.L.C., N.S.W., viii., 1894, 426) where *Liolopleura*, a curious misspelling of *Liolophura*, was printed.

CUMING, Hugh. (Plate xlvii.).

Born in South Devon, England, February 14, 1791, died at London, August 10, 1865. The world's greatest shell collector, his collection being later secured by the British Museum, and many species of Loricates have been described from

it by Reeve. Carpenter practically based his unpublished Monograph on Cum-
ing's material. He did not collect in Australia, but secured most of the speci-
mens that were collected by voyagers such as Jukes, Ince, and by collectors such
as Macgillivray, Strange, Cunningham and others. An epitome of his life was
published by Melvill (Journ. Conch., viii., 1895, 59) with a portrait here re-
produced.

CUNNINGHAM, Allan.

Born 1791, died 1839. Great botanical collector in Australia, who appar-
ently also collected marine shells for Cum-
ing, as Reeve described *Chiton cunning-*
hami (pl. xxvii., sp. 181, 184) from "Australia on the Rocks (Cunningham)."
This, however, was not an Australian species. Reeve also recorded *C. piceus*
from the same locality.

DALL, William Healey. (Plate xlvii.).

Born 1845 and still living and working. A famous American malacologist,
whose name may be bracketed with that of Pilsbry as the two most learned
malacologists the world will ever see; as each has worked in different groups
neither has dimmed the lustre of his friend. The broad views of each separate
them from present-day specialists and place them beyond future emulation. Dall
worked with Carpenter about fifty years ago on the Loricates, and published a
scheme adapted from Carpenter's MS. He proposed the following names:—
Heterozona, *H. cariosa*, *Lepidoradsia*, *Macandrellus* (Proc. U.S. Nat. Mus., i.,
1878), *Stectoplax*, *Angasia*, *Spongiochiton*, *Sclerochiton*, *Francisia*, *Lucilina* (Id.
ib., iv., 1881-2).

DESHAYES, Gerard Paul.

Born 1795, died June 9, 1875. Great French conchologist, who edited the
second edition of Lamarck's Hist. Anim. s. Verteb., in which he introduced the
new name *Chiton quoyi* for *C. viridis* Quoy & Gaimard.

DIEFFENBACH, Dr. Ernest.

Born 1811, died 1855. German scientist, who travelled through New Zea-
land, also collected Loricates at Newcastle and probably elsewhere in Australia.
Reeve described *Chiton proteus* and *C. dieffenbachii* from Newcastle, and re-
corded *C. lentiginosus* from that locality. Unfortunately the *C. dieffenbachii* is
another example of erroneous locality, the species being South American.

DUPUIS, Commandant Paul.

A recent Belgian conchologist, who for a little while examined the Loricates
in the Paris Museum, but little of value was gained owing to his previous lack
of knowledge of the group. He published two papers entitled "Notes prises au
cours de l'examen de la Collection de Polyplacophores du Museum de Paris"
(Bull. Mus. d'Hist. Nat., 1917, No. 7). He proposed *Ischnochiton iredalei*. His
collection of Loricates is now in the possession of Edwin Ashby.

ETHERIDGE, Robert, jr.

Born 1847, died 1920. Celebrated palaeontologist, who named a fossil
Loricata (problematical) *Chelodes calceoloides*.

FISCHER, Paul.

Born 1835, died 1893. (Obituary in Journ. de Conch., xlii., 1894, 1, and portrait). Famous French malacologist, who prepared an important Manuel de Conchyliologie forty years ago. He was not much interested in Loricates, although in this Manuel he proposed a novel nomenclature which, however, is not in accordance with present-day usage. Therein the name *Anisochiton* appears.

GABRIEL, Charles J. (Plate xlvii.).

Victorian conchologist who, after the retirement of Pritchard, collaborated with Gatliff in the continuation of the Catalogue of Victorian Mollusca. With his father Joseph Gabriel, he dredged in Port Phillip, Victoria. Hull named *Ischnochiton gabrieli*, and Ashby named *Acanthochiton gabrieli* in his honour.

GABRIEL, Charles J.

Born about 1790, died 1858. Associated as naturalist with Quoy on the voyages of the *Uranie* and *Physicienne* and the *Astrolabe*. Blainville named *Chiton gaimardi* after him.

GATLIFF, John Henry. (Plate xlviii.).

Born at Leeds, Yorkshire, England, May 17, 1848. Victorian conchologist, who collaborated with Pritchard in the preparation of a Catalogue of the Marine Mollusca of Victoria; when the first cataloguing was completed Pritchard retired, and papers in continuation have been written in collaboration with Gabriel. He has collected in Victoria westward to Portland Bay, and eastward to Kilcunda, including dredging in Port Phillip and Western Port; at Port Jackson and Botany Bay in New South Wales; at Devonport in Tasmania; and at Port Darwin in the Northern Territory. His references to Loricates, chiefly records of occurrences in Victoria, may be found in the Proceedings of the Royal Society of Victoria, Vols. 15, 18, 20, 21, 25, 27, 30 and 34. Ashby named *Acanthochiton gatliffi* and *Callistochiton gatliffi*, and Hall named the fossil *Cryptoplax gatliffi* in his honour.

GLAUERT, L.

Keeper of Biology of the Western Australian Museum. Has collected some Loricates, one of which was named *Acanthochiton spongiæ glauerti* by Ashby.

GOLDFUSS, George August.

Born 1782, died 1840. Published a Handbuch der Zoologie in 1820, in which he proposed *Crepidoda* for the Loricates.

GOULD, Augustus Addison.

Born 1805, died 1866. Famous American conchologist, who described the Loricates collected by Stimpson and Couthouy at Port Jackson on the U.S. Exploring Expedition under Captain Wilkes. Five species were named:—*Chiton fruticosus*, *C. jugosus*, *C. incanus*, *C. quercinus*, and *C. platessa* (Proc. Bost. Soc. Nat. Hist., ii., 1846) and these were figured in the U.S. Expl. Exped. Report, 1859, figs. 428, 437. The descriptions were reprinted in the Otia Conch., published in 1862, generic status being in some cases amended. He also described *Chiton lugubris* (Proc. Bost. Soc. Nat. Hist., vii., 1859, 163) and introduced the genus *Lucia* (Id. ib., viii., 1862, 283). The descriptions were also reprinted by Tenison-Woods in Proc. Linn. Soc. N.S.W., ii., 1878, 250.

GRAY, Dr. John Edward.

Born 1800, died 1875. One of the great British zoologists of the last century, and for many years head of the British Museum. At the early age of twenty-one he published in the London Medical Repository, Vol. xi., a scheme for the classification of the Mollusca by means of the animals (not shells), and therein introduced two generic names for Loricates, *Acanthochitona* and *Lepidochitona*, as well as the group name (from Blainville's vernacular) *Polyplacophora*. In the *Spicelegia Zoologica*, 1828, he published *Chiton glaucus* from New Zealand. Later he provided a classification of Loricates (P.Z.S., 1847) introducing many new names, such as *Ischnochiton*, *Onithochiton*, *Plaxiphora*; and in the same volume he listed the Genera of Recent Mollusca, naming types for each. Previously, in the Synopsis of the Contents of the British Museum, he had printed as *nomina nuda* only some divisions such as *Tonichia*. *Microplax grayi* H. Adams & Angas may have been named after him.

GUILDING, Lansdown.

Born circa 1797, died 1831. Studied the Mollusca in the West Indies, became interested in Loricates, and provided a novel scheme of classification in the Zool. Journ., v., 1829, 182, in which the new generic names *Phakellopleura* and *Acanthopleura* were introduced.

GUNN, Ronald. (Plate xlviii.).

Born at Cape Town, South Africa, April 4, 1808; arrived in Tasmania, 1829, where he died March 13, 1881. Great Tasmanian naturalist, who collected Loricates, and after whom Reeve named *Chitonellus gunnii*.

HADDON, Alfred Cort.

Born 1855. British Zoologist, who prepared an excellent account of the Loricates collected on the *Challenger* expedition (Zool. Rep. Challenger, xv., 1886). Later he visited Torres Strait, collecting in 1888, but then abandoned zoology in favour of ethnology. Eleven years later his collections were reported on by Melvill and Standen (Journ. Linn. Soc. (Lond.), Zool., xxvii., 1899, 150-206) where a few Loricates were listed as examined by Sykes, but no information of any importance was given relative to the ten species secured. Pilsbry named *Ischnochiton haddoni* after him.

HALL, Thomas Sargeant.

Born December 23, 1858, died December 21, 1915. Victorian geologist, who described two species of fossil *Cryptoplax*, *pritchardi* and *gatliffi*.

HARTMEYER, Richard.

One of the members of the German South West Australian Expedition under Michaelsen, after whom Thiele named *Cryptoplax hartmeyeri*.

HARVEY, William Henry.

Born 1811, died 1866. (Memoir published 1869). Great phytologist, who collected seaweeds and shells in South Australia, but his collections were mixed with others; hence *Chiton adalaidensis* was described by Reeve as from Port Adelaide, collected by Harvey, whereas it came from North Queensland, probably

collected by Jukes. *Chitonellus larvaeformis*, another North Queensland shell, was recorded by Reeve from Port Adelaide, this shell being afterwards named *Chiton burrowi* by E. A. Smith.

HEDLEY, Charles. (Plate xlviii.).

Born at Masham Vicarage, Yorkshire, England, February 27, 1862, died at Sydney September 14, 1926. The foremost malacologist Australia has known, whose recent death is deeply deplored. With Hull he wrote two papers on Loricates:—"Descriptions of New and Notes on other Australian Polyplacophora" (Rec. Aust. Mus., vii., 1909, 260-266, pls. lxxiii., lxxiv.) in which the following names were proposed:—*Lepidopleurus badius*, *Chiton translucens*, *C. vauchusensis*, and *C. torri*, the latter emended to *C. torriana*, page added 1910. "The Polyplacophora of Lord Howe and Norfolk Islands" (Proc. Linn. Soc. N.S.W., xxxvii., 1912, 271-281) in which *Chiton howensis*, the type of the genus *Tegulaplastax*, was described. With May he described the first Loricata from Australian deep water, *Lepidopleurus columnarius* (Rec. Aust. Mus., vii., 1908, 123, pl. xxiv.). With great magnanimity he allowed Iredale and Hull to specialise on this group, helping them in every way with advice. He listed the Queensland forms (Rep. A.A.A.S., 1909, 352); the Western Australian ones (W.A., i., 1914-15, 171-174) and the New South Wales ones (Journ. Roy. Soc. N.S.W., li., 1918) thus providing a basis for future workers. He also described the New Caledonian Loricata *Ischnochiton araucarianus*. Torr named *Plaxiphora hedleyi* in his honour.

HERRMANNSEN, A. N.

Compiler of the Index Generum Malacozoorum, in which he proposed the emendation *Chitoniscus* for *Chitonellus*.

HULL, Arthur Francis Basset. (Plate xlviii.).

Born at Hobart, Tasmania, October 10, 1862. First attracted to the study of Loricates by the discovery of fourteen species in one pool at Freshwater, near Manly, New South Wales, 1906. Has collected intensively in the vicinity of Port Jackson, and in a less degree on the coast of New South Wales from Montague Island to Coff's Harbour; Queensland from Southport to Thursday Island; Western Australia from Albany to Esperance; Tasmania, at Port Arthur, Maria Island, North-west coast, and Macquarie Harbour; King Island, Bass Strait, and also in New Caledonia. In addition to papers written in collaboration with Ashby (q.v.), Hedley (q.v.) and Iredale (q.v.) he has published the following:—
 1910. Description of a Fossil Lorica from North-western Tasmania. P.L.S., N.S.W., 654-5, pl. xvii.
 1912. Description of Two New Ischnochitons from Western Port, Victoria. Vic., 25 (N.S.), 120-1, pl. viii.
 1915. On a Collection of Fossil Polyplacophora from North-western Tasmania, with Descriptions of Three New Species. P.L.S., N.S.W., 855-857, pl. xciv.
 1922. A New *Rhyssoplax*. Aust. Zool., ii., 84-5, pl. xxivB.
 1923. New Australian Polyplacophora, and Notes on the Distribution of Certain Species. Aust. Zool., iii., 157-166, pls. xxiv., xxvi.
 ——. New Australian Loricata and Notes on the Distribution of Certain Species. Aust. Zool., iii., 195-201, pls. xxvii., xxviii.

1924. New Queensland Loricates. Proc. Roy. Soc. Queensland, xxxvi., 109-116, pl. xxi.

He has proposed the following new genera:—*Strigichiton* (1923), *Clavarizona* (1923), and *Aerilamma* (1924); and named the following forms:—*Ischnochiton gabrieli*, *I. falcatus*, *I. luticolens*, *I. examinandus*, *I. e. laetior*, *I. distigmatus*, *Ischnoradsia australis divaricata*, *Parachiton puppis*, *Terenoichiton erratus*, *Callistochiton granifer*, *Lorica duniana*, *Loricella magnifica*, *L. octoradiata*, *L. atkinsoni*, *L. paucipustulosa*, *Acanthochiton purpuratus*, *A. complanatus*, *Aerilamma primordia*, *Rhyssoplax surrecta*, *R. particolor*, *R. venusta*, *Lucilina rainfordiana*.

Iredale proposed *Chiton hullianus*, and Torr *Tonicia hulliana* in his honour.

HUTTON, Frederick Wollaston.

Born 1836, died 1905 (Obituary, Trans. N.Z. Inst., 1906). Great New Zealand zoologist, much interested in malacology. Early in his career he wrote up the New Zealand Loricates, but with these some Australian specimens were mixed (Trans. N.Z. Inst., iv., 1871, 179). He proposed *Chiton rudis*.

INCE, Captain.

Nephew of Dr. J. E. Gray; *captain of surveying ships, and a good collector after whom *Chiton incii* Reeve was named.

IREDALE, Tom. (Plate xlviii.).

Born at Workington, Cumberland, England, March 24, 1880. First collected Loricates in New Zealand, and later at Port Jackson and Shell Harbour, New South Wales; Port Curtis, Caloundra and Michaelmas Cay, Great Barrier Reef, Queensland; and Port Fairy and Western Port, Victoria. During his residence in England (1909-1923) he studied the collections in the British Museum, and examined the series of Loricates in the Paris Museum, which were forwarded to him. In 1924 he was appointed conchologist to the Australian Museum, Sydney. He has published the following papers relating to Loricates:—

1910. Notes on Polyplacophora, chiefly Australasian. Proc. Mal. Soc. (Lond.), ix., 90-105, and 153-162.

1914. The Chiton Fauna of the Kermadec Islands. *Id.*, xi., 25-51, pls. i., ii.

———. Some More Notes on Polyplacophora. *Id. ib.*, 123-131.

———. Report on Mollusca collected at the Monte Bello Islands. Proc. Zool. Soc. (Lond.), 665-675. Includes a review of *Acanthopleura*.

With W. L. May:—

1916. Misnamed Tasmanian Chitons. Proc. Mal. Soc. (Lond.), xii., 94-117, pls. iv., v.

With A. F. Basset Hull:—

1923-7. A Monograph of the Australian Loricates. Aust. Zool., iii. (1924-5), 186-194, 227-238, 277-297, 339-362, pls. xxxiii., xxxvii., xxxix., and xl., iv. (1925-7), 75-111, 164-185, 256-276, 324-328, 339-360, pls. ix., xii., xviii., xx., xxxvii., xxxix., xlv., xlvii., xlviii., xlix.

He has proposed the following genera:—*Terenoichiton*, and *Poneroplax*, and species:—*Plaxiphora matthewsi*, *Chiton hullianus*, *Lucilina shirleyi*.

With W. L. May:—Genera *Anisoradsia* and *Eudoxoplax*; species *Heterozona subviridis*, *Ischnochiton* (*Anisoradsia*) *mawlei*, *I. milligani*, *I. atkinsoni*, *I. torri*, *Callistochiton mawlei*, *Sypharochiton maugeanus*, *Rhyssoplax diaphora*.

With A. F. Basset Hull:—Genera *Autochiton*, *Subterenoichiton*, *Euporoplax*, *Euretoplax*, *Chartoplax*, *Levicoplax*, *Callistelasma*, *Callistassecla*, *Solivaga*, *Glyp-*

telasma, *Craspedoplax*, *Delicatoplax*, *Tegulaplax*, *Mucrosquama*, *Acanthozostera*; species and subspecies *Autochiton virgatus exaggeratus*, *Ischnochiton tateanus paradisiacus*, *Stenochiton longicymba historia*, *Stenochiton pilsbryanus dilatus*, *I. cuneatus*, *I. cygneus*, *Terenochiton liratellus*, *T. sperandus*, *Parachiton litoreus*, *P. capricornicus*, *P. opiparus*, *P. collusor*, *Levicoplax luminosa*, *Callistelasma periousia*, *C. generos*, *Acanthochiton crocodilus debilior*, *A. curiosus*, *A. denigma*, *A. sphenorhynchus*, *Notoplax speciosa addenda*, *N. subspeciosa*, *N. macandrewi*, *N. costata tasmanica*, *N. extra*, *Glyptelasma matthewsi occidentalis*, *Craspedoplax variabilis cambrica*, *C. v. diminuta*, *C. elegans*, *Cryptoplax mystica*, *C. striata occidentalis*, *C. iredalei attenuata*, *C. i. meridiana*, *C. royana*, *Tegulaplax matthewsi*, *Rhyssoplax excellens*, *Squamopleura carteri*, *Schizochiton polyops*, *Permodichiton australianus*.

JOHNSTON, Thomas Harvey.

Professor of Zoology at Adelaide University, previously at Queensland University, who wrote an Ecological Account of Caloundra, Queensland (Q. Nat., 1917).

JOHNSTON.

Western Australian collector, after whom Ashby named *Lophochiton johnstoni* and *Acanthochiton bednalli* var. *johnstoni*.

JUKES, Joseph Beete.

Born 1811, died 1869. Great British geologist who was naturalist on the survey ship *Fly*, and made fine collections which were scarcely reported upon. However, Reeve credits *Chiton volvox*, *C. divergens*, *C. ustulatus*, and *C. decussatus* to Jukes, the first named localised as from Sydney.

KIMBER, W. J.

South Australian collector after whom Torr named *Acanthochiton kimberi*.

KLEM, Walter.

South Australian collector, after whom *Rhyssoplax torriana* var. *klemi* was named by Ashby.

LAMARCK, Jean Baptiste Pierre Antoine de Nonet de. (Plate xlviii.).

Born 1744, died 1829. (Obituary Bull. Mus. Paris, 1907, 459). Great French conchologist whose *Histoire Animaux sans Vertebres* is the backbone of present-day malacological science. He introduced the genus *Chitonellus* with species *C. laevis* and *C. striata*. Thiele published Rochebrune's name of *Cryptoplax lamarcki*, and Dupuis added confusing data regarding this name.

LESUEUR, Charles Alexander.

Born 1778, died 1846. French artist-naturalist, associated with Peron on the ill-fated Baudin exploring expedition, and the collections are always credited to "Peron and Lesueur." A large number of Loricates were secured by these collectors in Australian waters, and one was named *Chiton sueurii* by Blainville.

LEWERS, Gerald Francis.

Born at Sydney, N.S.W., July 1, 1905. A young collector, who accompanied Hull on collecting trips to King Island and North Queensland.

LICHTENSTEIN, Martin Hinrich Carl.

Born 1780, died 1857. Director of the Berlin Museum. Published a Sale Catalogue entitled *Verz. samml. neuholl. Nat.* (1837) based on gatherings by Lhotsky, and included therein *Chiton mesoleucus*, a *nomen nudum*, but obviously based on the white-striped *Ischnochiton elongatus crispus* from Sydney.

LODDER, Miss.

Tasmanian conchologist, who issued a List of Tasmanian shells (Tas., 1900, 129-147) and on page 141 included thirty-one species of Loricates, many species of which were rejected by contemporary workers, but have since been rediscovered in Tasmanian waters.

McANDREW, George.

A keen New South Wales collector who has exploited Shellharbour, and taken many rare species of Loricates. *Notoplax macandrewi* Iredale & Hull was named in his honour.

MATTHEWS, Elijah Henry. (Plate xlviii.).

Born at Nottingham, England, September, 1850, arrived in South Australia in January, 1859. The Nestor of Australian Loricite workers who, encouraged by Bednall and well situated at Yorketown, made excellent collections of South Australian Loricates which provided the basis of Bednall's memorable essay. Since then Matthews has continued his interest in the group, collecting recently in Torres Strait where he recently added a new species to the Australian fauna, *Tegulaplex matthewsi*. He collaborated with Bednall in one paper only, but has recently enlisted C. Walton (q.v.) in the study of South Australian Loricates so that the work may continue. *Lepidopleurus matthewsianus* Bednall, *Acanthochites matthewsi* Pilsbry, *Platiphora matthewsi* Iredale, and *Tegulaplex matthewsi* Iredale & Hull were named in his honour.

MAUGHAN, M. M.

South Australian collector, who wrote one paper: "Description of a New Species of South Australian Polyplacophora" (Trans. Roy. Soc., S.A., xxiv., 1900, 89) the species described being *Chiton oruktus*. Torr & Ashby named *Acanthochiton maughani*, and Ashby named *A. pilsbryi* var. *maughaneanus* after him.

MAWLE, Frederick Ernest. (Plate xlviii.).

Born at Saltwater River, Tasman's Peninsula, 1866. A keen Tasmanian collector who, at May's request, investigated the Loricite fauna of Tasman's Peninsula, making known an extensive faunula and the results formed the basis of a paper by Iredale & May (q.v.) in which they named *Ischnochiton (Anisoradsia) mawlei* and *Callistochiton mawlei* after him. He has also collected on the east coast of Tasmania, from Swansea to St. Helens.

MAY, William Lewis. (Plate xlviii.).

Born in South Australia 1861, died August 30, 1925. Prominent Australian conchologist who worked at the Mollusca of Tasmania for many years. With Tate (q.v.) he published a Revised Census of the Marine Mollusca of Tasmania. In 1912, in collaboration with Torr, he published "The Polyplacophora of Tas-

mania" (Tas., 1912, 25-40). He recorded the species from the Furneaux Group (Vict. Nat., xxxi., 1913, 59); then through Mawle's researches, financed by himself, he obtained extensive material, and, in collaboration with Iredale (q.v.) he revised the group in a paper entitled Misnamed Tasmanian Chitons. In 1919 he described *Callochiton elongatus* (Tas., 1919, 55). In 1921 he published a Checklist of the Mollusca of Tasmania, listing the Loricates on pages 30-34. This publication was supplemented in 1923 by his "Illustrated Index of Tasmanian Shells," where all the species were figured, and in the appendix a new name, *Lepidopleurus profundus*, appeared. In the same year he published "Mollusca of King Island" (Tas., 1923, 47-55), listing fifteen species of Loricates. His collecting was principally carried on at Frederick Henry Bay and Tasman's Peninsula, the first Loricata taken being the little black shell subsequently named after him by Pilsbry. He also collected in the Derwent Estuary, D'Entrecasteaux Channel, Maria Island, East Coast, North-west Coast, Furneaux and King Islands, Bass Strait. He carried on dredging operations with Hedley off Cape Pillar, taking *Lepidopleurus columnarius*, which he described jointly with Hedley (q.v.). Pilsbry named *Ischnochiton mayi*, Torr named *Callochiton mayi*, and Ashby named *Callistochiton mayi* and *Acanthochiton mayi* in his honour.

MENKE, Karl Theodor.

Born 1791, died 1861. Great German malacologist who wrote a *Molluscorum Novae Hollandiae Specimen* in 1843, based on collections made in Western Australia; three species of Loricates were included, but only one has since been recognised. In a revision (*Zeitschr. für Malak.*, 1844, 62) he introduced *Chiton coccus* which has just recently been rediscovered.

MICHAELSEN, Wilhelm.

Born 1860. Leader of the German South West Australian Expedition, after whom Thiele named *Cryptoplax michaelsoni*.

MIDDENDORFF, Alexander Theodor von.

Born 1815, died 1894. Russian zoologist, who made an intensive study of Loricates, dealing principally with Palaearctic species, and proposed an elaborate classification which has been neglected as too complicated nomenclaturally. (*Mem. Sci. Nat. Acad. Imp. Sci., St. Petersburg*, vi., 1847). He proposed *Hama-chiton*, *Platysemus*, *Ametrogephyrus*, *Phaenochiton*, *Dichachiton*.

MILLIGAN, Joseph.

Born in Dumfriesshire, Scotland, 1829; arrived in Tasmania 1851, aged 22, as surgeon to the Van Diemen's Land Company. Tasmanian zoologist, one of the founders and for many years secretary to the Royal Society of Tasmania, who was apparently an early enthusiastic collector of Loricates. *Vide* Iredale & May's "Misnamed Tasmanian Chitons" for the facts. These authors named *Ischnochiton milligani* after him. He returned to Scotland in 1860, where he died in 1883, aged 76.

NIERSTRASZ, H. F.

Dutch conchologist, who wrote up the Loricates collected by the Siboga Expedition to the Moluccas (Siboga Exped. (*Der Chitonen*) Mon., xlviii., 1905) and recorded *Acanthochites bednalli* since named *A. nierstraszi* Thiele. In two

later papers he added many museum records which must be rejected. (Tijdschr. Nederl. Dierk. Vereen. (2), x., 1905, 141-172). (Notes Leyden Mus., xxv., 1905, recording *Liolophura gaimardi* from the Moluccas!).

ODHNER, Nils Hjalmar.

Of the Rijks Museum, Stockholm. Leading continental malacologist, who reported upon Mjöberg's collection from North-west Australia, and added two Loricates, *Craspedochiton laqueatus* (= *jaubertensis* Ashby) and *Tonicia truncata* (= *dilecta* Thiele) (Kungl. Svenska Vetensk. Handl. Bd., 52, 1917). He has since reported on the Loricates collected by the Swedish Antarctic Expedition (Schwedische Sudpolar Exp., 1901-3, Vol. i., No. 3, 1923).

PAETEL, Friedrich.

Born 1812, died 1888 (Obituary notice Journ. de Conch., xxxvii., 1889, 94). German conchologist, who prepared a catalogue of his collection and developed it almost into a list of the shells of the world. His collection is now in the Berlin Museum. He listed *Chiton tasmanicus* Cpr. a *nomen nudum*. Thiele named *Plaxiphora paeteliana* after him.

PATTISON, George.

Lighthouse-keeper at Cape Banks, South Australia; a collector after whom Ashby named *Chorioplax grayi pattisoni*.

PERON, Francois. (Plate xlix.).

Born 1775, died December 14, 1810. One of the greatest French naturalists, who visited Australia with the Baudin expedition. Associated with Lesueur he made wonderful collections which were placed in the Paris Museum. Unfortunately he died before he was able to work at them, and the new species were described by others who had not access to his complete MSS. As the collections had been mixed owing to shipwreck, great difficulty has attended the recognition of many species. The Loricates were described by Blainville (q.v.) and were subsequently worked at by Rochbrune who confused the specimens in an unforgivable manner. Recently Thiele, Iredale, Dupuis, and Ashby have examined the Rochbrune complications, with not altogether satisfactory results. Rochbrune named *Cryptoplax peroni* after him.

PILSBRY, Professor Henry Augustus.

Born, 1862. The peer of Dall and co-equal as leading malacologist of all time. With the use of Carpenter's MSS. he wrote a Monograph of Loricates which made this group a simple study, whereas previously it had been the home of inexplicable mystery. The extraordinary ability of this genius becomes the more impressive the more this group is studied.

The Monograph is contained in the Manual of Conchology (Tryon) Vols. xiv. and xv., 1892-3. The new generic or subgeneric names proposed in these volumes included *Heterozona*, *Loricella*, *Angasia*, *Spongiochiton*, and *Sclerochiton*, new species including *Ischnochiton haddoni*, *I. intergranosus*, *I. intricatus*, *I. intricandus*, *I. sowerbyi*, *I. cariosus*, *I. subcariosus*, *Callochiton lobatus*, *Plaxiphora excurvata*, *Chiton aurantius*, and *Chiton miles*. Through the publication of this Monograph Pilsbry was supplied with long series of new Loricates from Aus-

tralia, so that he described many more, as noted below, but after having shown the Australian collectors how to walk alone he left the field to them. The following are his additional papers and the new names proposed therein:—

1893. On *Acanthopleura* and its Subgenera (Nautilus, vi., 105. *Liolophura*).
 —. Notes on the Acanthochitidae with Descriptions of New American Species. (*Id. ib.*, 32. *Loboplax*).
 1894. Notices of New Chitons, I. (Nautilus, vii., 107. *Meturoplax*, *Acanthochites retrojectus*).
 —. Notices of New Chitons II. (*Id. ib.*, 119, *Chiton coxi*, *Acanthochites coxi*, *A. matthewsi*).
 —. Notices of New Chitons III. (*Id. ib.*, 139, *Phacellozona*, *Chorioplax*).
 —. Descriptive Notices of New Chitons V. (*id.*, viii., 55, *Ischnochiton ptychius*, *Chiton (canaliculatus* var. ?) *tricostalis*, *Chiton aereus* var. *calloiozona*).
 —. List of Port Jackson Chitons collected by Dr. J. C. Cox, with a Revision of Australian Acanthochitidae (Proc. Acad. Nat. Sci. Philad., 69-89, *Haploplax*, *Ischnochiton smaragdinus picturatus*, *Acanthochites bednalli*, *Liolophura gaimardi queenslandica*).
 1895. Note on Tasmanian Acmæa and Ischnochiton (*Id. ib.*, 128, *Ischnochiton (Haploplax) mayi*).
 —. Description of a New Australian Chiton (*Id.*, ix., 90, *Chiton bednalli*).
Ischnochiton pilsbryi Bednall, *I. pilsbryanus* Bednall, and *Acanthochiton pilsbryi* Sykes were named in his honour.

PLATE, Ludwig Hermann.

Born 1862. In connection with the Fauna Chilensis he furnished a voluminous report on "Die Anatomie und Phylogenie der Chitonen" (Zool. Jahrb. Suppl. Bd., iv., vi., 1897-1905) concluding with a phylogenetic tree, closely following that provided by Pilsbry in the Manual.

PRITCHARD, Dr. G. B.

Victorian collector who collaborated with Gatliff in the preparation of a Catalogue of the Marine Shells of Victoria; the Loricates being listed in Proc. Roy. Soc. Vic., xv. (N.S.), 1902-3, 198 et seq. Hall named a fossil, *Cryptoplax pritchardi*, after him.

QUOY, Jean Rene Constant.

Born 1790, died 1869. Great French naturalist, associated with Gaimard on two French voyages, the *Uranie* and *Physicienne* and the *Astrolabe*. They must have been much interested in the Loricates, as they collected a fine lot, figuring and describing them well (Voyage de l'*Astrolabe*, iii., 1835) naming *Chiton sulcatus*, *C. fasciatus*, *C. oculatus*, *C. glaucus*, *C. viridis*, and *C. georgianus*. Deshayes renamed their *C. viridis*, *C. quoyi* after Quoy.

RAINFORD, E. H.

Queensland naturalist, who assisted and collected Loricates with and for Hull, and after whom *Lucilina rainfordiana* was named.

REEVE, Augustus Lovell. (Plate xlix.).

Born April 19, 1814, died October, 1865. (Notice by Melvill Journ. Conch., ix., 1900, 344 et seq. with portrait). The greatest conchological worker of the

last century and a worthy peer of the inimitable collector Hugh Cuming. He published large illustrated Monographs, the illustrations being paintings of the highest class by Sowerby. In the Conch. Icon., iv., 1847, Monograph of *Chiton*, he described *C. adelaidensis*, *antiquus*, *arbutum*, (*carinulatus*), *castus*, *cimolius*, *concentricus*, *contractus*, *crispus*, *crocinus*, *cunninghami*, *decussatus* (*dieffenbachii*), *divergens*, *elongatus*, *fortiliratus*, *incii* (*inquinatus*), *metallicus*, *novae-hollandiae*, *pictus*, *proteus* (*sinclairei*), *ustulatus*, *virgatus*, *volvax*, and in the Monograph of *Chitonellus* included *C. rostratus* and *C. gunnii*. He credited Ince with collecting *C. australis*, *elongatus*, *fortiliratus*, *incii*, *pictus*, and *Chitonellus rostratus* at Raine I.; Dieffenbach with *C. proteus* and *C. dieffenbachii* at Newcastle, and also *C. lentiginosus* Sowerby at the same locality; Sinclair with *C. inquinatus*, *carinulatus*, and *sinclairei* at Van Diemen's Land; Jukes with *C. decussatus*, *divergens*, *ustulatus*, and *volvax*; and, while recording Harvey as the collector of Queensland shells at Port Adelaide, did not mention his name in connection with *C. virgatus* from Port Lincoln, which he probably did collect.

RISSO, Antoine.

Born 1777, died 1845. A European zoologist, who wrote a Natural History of South Europe in 1826, and therein published Leach's names *Acanthochites* and *Lepidopleurus*.

ROCHEBRUNE, A. T. de.

Died April 23, 1812, in his 80th year. An erratic French malacologist, who worked at the Loricates in the Paris Museum and renamed Blainville's species. He mixed the specimens up, so that it is now difficult to trace the original examples described, and recent students have been handicapped in their efforts. Many recent notes published are incorrect owing to lack of time to unravel the tangle. Rochebrune's descriptions were published as follows:—

- 1881. Bull. Soc. Philom. Paris (7), v., *Gymnoplax urvillei*.
- 1882. *Id.*, vi., *Cryptoplax montanoi*, *C. peroni*, *C. caledonicus*, *C. huerteli*, *C. unciniferus*, *C. torresiana*, *Chaetopleura biarmata* (the last named is not Australian), *Acanthochites tristis*, *A. turgidus*, *A. jucundus* (not Australian).
- 1884. *Id.*, viii., *Schizochiton nympha*.

SAUNDERS, Frank Lionel.

Born at North Adelaide, S.A., October 30, 1887. A South Australian collector who first discovered the true habitat of *Stenochiton*, the discovery being exploited by Ashby, who named *Anisoradsia mawlei* var. *saundersi* after him.

SCHOLVIEN.

Apparently a conchologist, after whom Thiele named *Onithochiton scholviensis* from specimens in the Scholvien collection, now in the Hamburg Museum.

SCHUMACHER, Heinrich Christian Friedrich.

Born 1757, died 1830. Danish conchologist, who in his "Essai d'un Nouveau Systeme des Habitations des Vers Testacees," published in 1817, separated the Loricates and provided the group name LORICATA.

SHIRLEY, Dr. John.

Born at Dorchester, England, 1849, died at Brisbane, Queensland, April 5, 1922. Queensland naturalist, who enthusiastically but without judgment collected shells, receiving exchanges and without criticism accepting absurd records, mixing South Australian with Queensland shells. For example, he sent Iredale *Acanthochites matthewsi*, *Rhyssoplax verconis*, and *Plaxiphora costata* as from Burleigh Heads, Queensland, whereas the specimens had been given to him by South Australian workers. Iredale named *Lucilina shirleyi*, and Ashby *Acanthochiton shirleyi* after him.

SHUTTLEWORTH, Robert James.

Born in Devonshire, England, 1810, died in Switzerland, where he had lived most of his life, April 19, 1874. (Obituary Journ. de Conch., xxiii., 1875, 95). He published in German in the Mittheil. Naturf. Gesellsch. Berne, 1853, "Diagnosen neuer Mollusken," where he introduced several new genera for Loricates, including *Aulacochiton*, *Craspedochiton*, *Ischnoradsia*.

SINCLAIR, Dr. Andrew.

Collected in New Zealand and Tasmania, and his collections were recorded by Reeve as from the latter locality, whereas they were principally from the former, but a South American Loricata was also confused.

SMITH, Edgar Albert. (Plate xlix.).

Born November 29, 1847, died July 22, 1916. (Obituary Notice Proc. Mal. Soc. (Lond.), xii., 1916, 215). Conchologist at the British Museum for about forty years, having entered in 1867 and retired in 1913. Little interested in Loricates, but dealt with Coppinger's collection made on the voyage of the *Alert*, and described *Chiton* (*Callistochiton*) *coppingeri*, *Callistochiton sarcophagus*, *Chiton* (*Acanthochiton*) *asbestoides*, *Chiton* (*Chitonellus*) *burrowi*, *Chiton* (*Ischnochiton*) *curtisanus*, and recorded *C. adelaidensis*, amplifying Reeve's description (Zool. Coll. *Alert*, 1884).

SOWERBY, George Brettingham.

The second of that name. Born 1812, died 1884. He published illustrated Monographs, and then painted the illustrations for Reeve's Monographs, all very beautiful and accurate paintings. In the Mag. Nat. Hist. (Charlesworth) iv., 1840, he described *Chiton versicolor*, *C. australis*, *C. evanidus*, *C. lentiginosus*, *C. petholatus* and var. *porphyrius* (*C. spiniger*) and (*C. sculptus*). He then monographed the genus the same year in the Conchological Illustrations, figuring all the above, and also *C. spinosus* Brug. from Australia and *C. longicymba* from Hunter River, the latter not Blainville's species. Previously, in the "Genera Rec. Fossil Shells," pt., xii., 1822, he had named and figured *Chiton chitonellus* and *C. cruciformis*, only new names for previously described species of *Cryptoplax*. Carpenter named in MS. *Ischnochiton sowerbyi*, which Pilsbry published.

STANGER, Dr.

Born 1812, died 1854. Medical officer on a whaling vessel for health, visited New Zealand and Australia. Credited by Sowerby (q.v.) with collecting *Chiton versicolor* and *C. lentiginosus*.

STIMPSON, William.

Born 1832, died 1872. Naturalist on Wilkes U.S. Exploring Expedition, who collected Loricates while at Sydney, the species being described by Gould (q.v.). His journal has been reprinted by Hedley.

STRANGE, Frederick.

Born at Aylsham, Norfolk, England, killed while collecting on Percy Island, Queensland, October 10, 1854 (Hedley, N.Z. Colonial Mus. Bull., No. 1, 1905, 50). Natural history collector in the first half of last century; collected in Australia and New Zealand. A. Adams described *Chiton muricatus* and *C. versicolor* as from Sydney, collected by Strange.

SUTER, Henry.

Born at Zurich, Switzerland, March 9, 1841; landed in New Zealand, 1886; died at Christchurch, N.Z., July 30, 1918. Famous New Zealand malacologist, who was much interested in Loricates. He described *Chiton quoyi* var. *limosa* in the Journ. Malac., xii., 1905, 69, which appeared on December 30, 1905, but this variety had been previously introduced into literature under the same name by Nierstrasz (Notes Leyden Mus., xxv., 151, April 15, 1905).

SWAINSON, William.

Born 1789, died 1855. Wrote his own biography in "Taxidermy," a volume of Lardner's Cyclopaedia. Famous British zoologist, who wrote a Treatise on Malacology, and then emigrated to New Zealand (1840) and later came to Australia. In his last paper in the Papers and Proceedings of the Royal Society of Van Diemen's Land (iii., pt. 1, January, 1855) referring to Loricates, he noted "I possess figures and descriptions of more than thirty species discovered in Port Jackson alone, besides thirteen others I procured or detected further north of that locality, near the Estuary of the Hunter River."

SYKES, Ernest Ruthven. (Plate xlix.).

Born 1867. British malacologist, who furnished a Report on a Collection of Polyplacophora from Port Phillip, Victoria (Proc. Mal. Soc. (Lond.), ii., 1896) the first fruits of Pilsbry's Monograph. He therein named *Ischnochiton crispus* var. *decorata*, *I. wilsoni*, *I. (Haploplax) pura*, *Acanthochites pilsbryi*, *A. (Notoplax) wilsoni*, *A. (N.) glyptus*, and *Chiton limans*. He later furnished a report on the Ceylon Loricates (Ceylon Pearl Oyster Fisheries, 1903) in which he recorded *Callochiton platessa* (?) from Ceylon.

TAPPARONE-CANEFRI, Cesare Maria.

Born 1838, died 1891. In the Zool. Viag. Magenta Malac., 1874, 77, he recorded *Chiton piceus* Gmelin from Sydney, obviously *Liolophura gaimardi*.

TATE, Ralph. (Plate xlix.).

Born in England, 1840, died at Adelaide, South Australia, 1901. Professor of Geology at the University of Adelaide. Edited Woodward's Manual of the Mollusca, adding an Appendix, before he came to Australia. Though he wrote little on Loricates, he was very helpful to other workers. With May be pub-

lished a Revised Census of the Marine Mollusca of Tasmania (P.L.S., N.S.W., xxvi., 1901) in which appears the *nomen nudum* *Lepidopleurus matthewsi*. Bednall named *Ischnochiton tateanus*, Torr & Ashby named *Acanthochites tatei* and Ashby named *Stenochiton tatei* after him.

TENISON-WOODS, Rev. Julian Edward. (Plate xlix.).

Born 1832, died 1889. Great Australian zoologist, who prepared a Census of the Marine Mollusca of Tasmania, and noted the abundance and variety of Loricates. He seemed, however, to regard many species as aberrations only. Later he described a new species, *Chiton inornatus* (Vic., xvii., 1881).

THACKWAY, Albert Edward John. (Plate xlix.).

Born at Hereford, England, May 30, 1885. A New South Wales collector, who obtained an extensive series of Loricates at Port Stephens, subsequently written up by Ashby, who named *Acanthochiton thackwayi* after him.

THIELE, Professor Johannes.

Born at Goldap, East Prussia, October 1, 1860. Appointed to the Berlin Zoological Museum, April 1, 1899, and is still carrying out his research work there. He completed the work on the Radulae of the Mollusca commenced by Troschel, and among the Loricates named many genera from the study of this organ alone. (Das Gebiss der Schnecken (Troschel), ii., 1892) proposing *Icoplax*, *Mecynoplax*, *Rhyssoplax*, *Clathropleura*, *Amaurochiton*, *Poeciloplax*, *Sypharochiton*, *Triboplax*, *Toniciopsis*. Pilsbry pointed out that from a study of shell characters these groups did not seem well founded, so Thiele later studied the shells in conjunction with the radulae and provided a valuable revision (Revision Chitonen (Chun's Zoologica, heft 56) 1909-10) proposing *Parachiton*, *Thaumastochiton*, *Cryptoplax coronatus*, *C. lamarecki*, *Plariphora tasmanica*, *P. bednalli*, *P. paeteliana*, *Chiton (Clathropleura) bellulus*, *Sclerochiton aruensis*, *Onithochiton scholviensis*. Later he worked out the Loricates collected by the German South West Australia Expedition (Fauna Sudwest Austral. Bd., iii., heft ii., Polyplacophora, December, 1911) proposing *Ischnochiton albus*, *I. indifferens*, *Callistochiton recens*, *Acanthochites deliciosus*, *Cryptoplax michaelsoni*, *C. hartmeyer*, *Lucilina dilecta*.

THOMAS, H.

South Australian artist, who made the excellent drawings to accompany Bednall's historic paper on South Australian Loricates, and for whom Bednall named *Ischnochiton thomasi*.

TORR, Dr. William George. (Plate xlix.).

Born in Tavistock, Devonshire, England, May 26, 1853. Well known and enthusiastic collector and author. In addition to the Mediterranean and Northern Europe, he has collected widely in New Zealand, but his most fruitful work has been done in South and Western Australia, he having accompanied Sir Joseph Verco on his dredging expeditions to the Nuyts and Recherche Archipelagoes in the Great Australian Bight, and from Albany to Geraldton in Western Australia. He has explored much of the 1,200 miles of coastline of South Australia; has collected in Port Phillip, Victoria, in Port Jackson, New South Wales; and on the Queensland coast from Tweed Heads to Cairns. He has visited Tasmania several times, and collected principally on the

North-west Coast and at Port Arthur. Notwithstanding his age, his great delight is still to wade in rock pools collecting Loricates. In addition to papers written jointly with Ashby (q.v.) and May (q.v.) Torr has published the following:—

1898. Definitions of Seven New Species of South Australian Polyplacophorae (jointly with Ashby). (S.A., xxii., 215-221, pls. vi., vii.). In this paper the following species were described:—*Acanthochites talei*, *A. maughani*, *A. verconis*, *A. crocodilus*, *A. cornutus*, *A. exilis*, *Chiton verconis*.
1911. Western Australian Polyplacophora. (S.A., xxxv., 94-107, pls. xxiv., xxv.). Species described:—*Ischnochiton verconis*, *Lepidopleurus niger*, *Platiphora zebra*, *P. hedleyi*, *P. pustulosa*, *Acanthochites subviridis*, *Tonicia hullianus*.
1912. On a New Tasmanian Chiton. (Tas., 1912, 1-2). *Callochiton mayi*.
1913. South Australian Polyplacophora. (S.A., xxxvi., 140-170, pls. v., vii.). *Ischnochiton bednalli*, *I. bakeri*, *I. levis*, *Lepidopleurus pelagicus*, *Acanthochites kimberi*, *A. rufus*, *A. rubrostratus*.

Shells named in his honour include *Chiton torri* Suter, *C. torrianus* Hedley & Hull, *Ischnochiton torri* Iredale & May.

URVILLE, Jules Sebastien Cesar Dumont d'.

Born 1790, died 1842. Leader of three French exploring expeditions, all of which touched Australia, the *Coquille*, 1822-25, the *Astrolabe*, 1826-9, and the *Astrolabe* and *Zelee*, 1837-40. On the firstnamed Lesson was the naturalist, on the second Quoy & Gaimard, and on the third Hombron, Jacquinot being a captain. Rochebrune named *Gymnoplax urvillei* after him.

VERCO, Sir Joseph Cook.

Born at Fullarton, South Australia, August 1, 1854. Famous Australian conchologist, who dredged largely in South Australian waters, handing over the Loricates he secured to Torr and Ashby. Later he assisted Torr in the investigation of the Western Australian forms. *Chiton verconis* Torr & Ashby, *Acanthochites verconis* Torr & Ashby, and *Ischnochiton verconis* Torr, were named in his honour.

WALTON, Charles. (Plate xlix.).

Born at Walkerville, South Australia, October 1, 1863. South Australian collector, and disciple of E. H. Matthews, who has published a popular account of "Collecting Mollusca at the Outer Harbour" (S.A. Nat., February, 1924) in which the local Loricates and the mode of preserving them are detailed. He has acquired the following aberrants, not included in Appendix A:—*Poneroplax albida*, *Ischnochiton contractus* (2), *Notoplax costata*, and *Stenochiton longicymba*, each with seven valves, *Heterozona cariosa*, and *Rhyssoplax torriana*, each with six valves.

WOOD, William.

Born 1774, died 1857. An English conchologist, who published a General Conchology in Monographs, 1814, the genus *Chiton* being the first one issued. He knew no Australian species, but introduced names which were later selected for Australian species by authors who had overlooked his work, their names thus becoming invalidated.

REVIEWS.

[The almost simultaneous appearance of three imposing volumes dealing with Australasian animals and insects is an event worthy of special comment. The authors are all members of this Society].

THE INSECTS OF AUSTRALIA AND NEW ZEALAND.

By R. J. Tillyard, D.Sc., F.R.S. Sydney, Angus & Robertson, Ltd., 1926. (42/-).

The appearance of Dr. Tillyard's new book, "The Insects of Australia and New Zealand," is of almost epoch-making importance to Australian and New Zealand entomologists. The need for a comprehensive systematic text-book dealing with Australasian insects has long been felt, and Dr. Tillyard's book appears to be of just the type best suited to serve the needs of Australasian entomologists.

This work is essentially systematic in character and the major portion of the book is devoted to the classification of insects into families and major groupings, though much information is given incidentally about the morphology and general bionomics of various types of insects. Insects of economic importance are also dealt with briefly in this portion of the book. Species which are outstanding, owing to their commonness, conspicuousness or special interest, are briefly mentioned in the descriptions of the various families in such a manner that they can be recognised with a fair degree of accuracy, and in many cases identification is simplified by the excellent figures. Naturally, nothing in the way of complete specific descriptions is attempted.

It is refreshing to find that practically the whole of the numerous and really excellent figures are original, as one is naturally apt to become very tired of seeing the same figures reproduced in text-book after text-book. Special mention must be made of the plates, many of which are coloured. These not only add considerably to the attractiveness of the book, but also render the identification of many outstanding species of insects particularly easy.

When one considers the vast amount of original research Tillyard has carried out in recent years on the wing-venation of insects, it is natural that this subject should receive great attention in his book. This portion of the book will be of particular importance to entomologists in all parts of the world, as, for the first time, a connected account of wing-venation is given, which includes all the various and important modifications introduced by Tillyard. Naturally by no means all entomologists will approve of all these modifications, but it is satisfactory to have them dealt with in an easily accessible form. Personally, after several years experience in teaching this subject, I have found Tillyard's modifications of the Comstock and Needham system of wing-vein nomenclature much simpler and more straightforward than the original system, and I think others will find the same when they become familiar with the modifications. A particularly noticeable example of this is to be found in the Hymenoptera. Tillyard's interpretation of the venation in this order is so simple that I find students can understand it in the space of a few minutes, whereas the old system was so complex and difficult that it was ignored by most entomologists.

In most orders the system of classification adopted by Tillyard is somewhat original, but in nearly all cases the differences from the more familiar systems are more apparent than real. This is due to a very laudable attempt to use the same type of nomenclature and classification for the major groups in each order. Thus orders are consistently divided into sub-orders and super-families, these usually taking the place of divisions, series, etc., of previous

systems of classification. The nomenclature of the super-families is made to follow a definite rule, and this is to be preferred to the arbitrary method of naming major groups in the older systems. It is very satisfactory to note that a complete classification as far as families is given for all orders, as the small orders are usually passed over with a brief mention in text-books, with the result that it has been very difficult in the past to find an adequate description of the classification of the minor orders.

In addition to the purely systematic portion of the book, chapters are given on external and internal morphology and life-history. To my mind these err on the side of briefness, but no doubt considerations of the permissible size of the book and the adequate manner in which these subjects have been dealt with in many other text-books have determined the rather limited extent of these chapters. There is also a short but very instructive chapter on the fossil record and origin of Australian and New Zealand insect faunas; and an extremely useful chapter on the collection, preservation and study of insects. The latter chapter is more comprehensive than is usually the case when dealing with this subject, and it contains a fund of useful information.

The lists of references to important papers given at the end of each chapter add greatly to the usefulness of the book to advanced workers, while the glossary given at the end of the book will be of great use to the student.

It would be easy to criticise the book on account of omissions, but I believe such criticism to be unjustifiable in view of the very definite limitations in space imposed in the production of this text-book. Dr. Tillyard has shown great discrimination in the choice of the subject matter of his book, in order that it may be of the greatest use to Australasian entomologists, and I commend it to the attention, not only of all Australian and New Zealand entomologists, but of all entomologists, wherever they may be situated. It is certain that all will find much of interest and use to them in this book.

A.J.N.

THE WILD ANIMALS OF AUSTRALIA.

By A. S. Le Souef and Harry Burrell, with a Chapter on The Bats of Australia and New Guinea, by Ellis le G. Troughton. London. Harrap, 1926.

Since Lucas and Le Souef's well known "Animals of Australia" has been out of print for some time, a new work upon Australian mammals is particularly welcome. Although the opening sentence of the preface claims that information concerning all the Australasian mammals has been collected in one volume, this is not strictly so, since the Cetacea are not included. This is the more difficult to understand when one finds other marine mammals, the seals and the dugong, included. Further, the use of the word "animals" in the title, in place of "mammals," to which the book is confined, seems an unhappy concession to a popular but unscientific connotation.

These criticisms, however, need not detract from the value of the book itself. Eighty pages are devoted to an excellent account of the Chiroptera, by a competent mammalogist, Mr. Troughton, complete with keys, and with the dental formula for each genus. No complete account of the bats of Australasia has hitherto been published, and Mr. Troughton is to be congratulated upon a piece of work which is in accord with the best handbook traditions.

The remaining three hundred pages cover accounts of the carnivores, the dugong, rats and mice, and the marsupials and monotremes. The genera are diagnosed, and species and sub-species defined. Since in all some 400 species are dealt with, it is obvious that a very limited space must be devoted to individual species. The generic descriptions would have been improved by the inclusion of dental formulae, without great sacrifice of space. It seems a pity, too, that the field knowledge of the authors, which does, in many places, inform their brief descriptions, could not have found more expression. But we must thank them for what they have given us, which is a compilation of great value, and not grumble because it might have been more.

Here is brought together on good paper and in pleasant type, a complete account of all Australasian marsupials and monotremes so far described, a task which has involved a very considerable research into a widely scattered literature. The book is admirably balanced, and is beautifully illustrated with photographs of the living animals, most of which have been taken by Mr. Burrell, who has devoted much time and infinite patience to the adequate portrayal of our beautiful native mammals. It is a handbook for which we must offer our best thanks, both to the authors and to their publisher.

L.H.

THE PLATYPUS.

By Harry Burrell, C.M.Z.S. Sydney; Angus & Robertson, Ltd., 1927 (25/-).

In the minds of most Australians the Platypus and Harry Burrell are linked together by those ties which are woven of the lasting fabric of constant association. The first to construct a model habitation for the Platypus in captivity, Mr. Burrell carried out a close study of the animal under daily observation in the old Zoological Gardens at Moore Park. Both before and since that memorable experiment this enthusiastic student of the *Ornithorhynchus* has spent many strenuous years in the pursuit and observation of the animal in its native haunts. The results of his work have been from time to time embodied in the form of interim papers published in the *Australian Zoologist*, but the present work is monumental in its all-embracing pages, which deal in detail with the discovery, zoological position, form and characteristics, habits, and life-history of the Monotreme. One reads page after page, chapter after chapter of deeply interesting matter couched in dignified scientific language, graceful in diction, informative, and, where the opinions of other scientists are criticised, the case is presented for the most part in polished terms. It is therefore the more surprising to find, in the midst of such discourse, curious paragraphs that would be more suitably contained in the "Aboriginalities" column of the *Sydney Bulletin*. The frequent use of colloquialisms and coined words, generally in inverted commas, such as "lipped-in" (p. 123) and "buck barracks" (p. 164) may be arresting, but is not in keeping with the tone of the greater part of the work. If the guiding hand that obviously directed Mr. Burrell's literary labours had modified these solecisms the work would have been faultless; as it is, however, it can only be described as a wonderful work. The illustrations, from the author's own photographs, are of high excellence, and the fact that the book was wholly set up and printed in Australia is a tribute to the enterprise and resources of the well known firm responsible for its production.

A.F.B.H.

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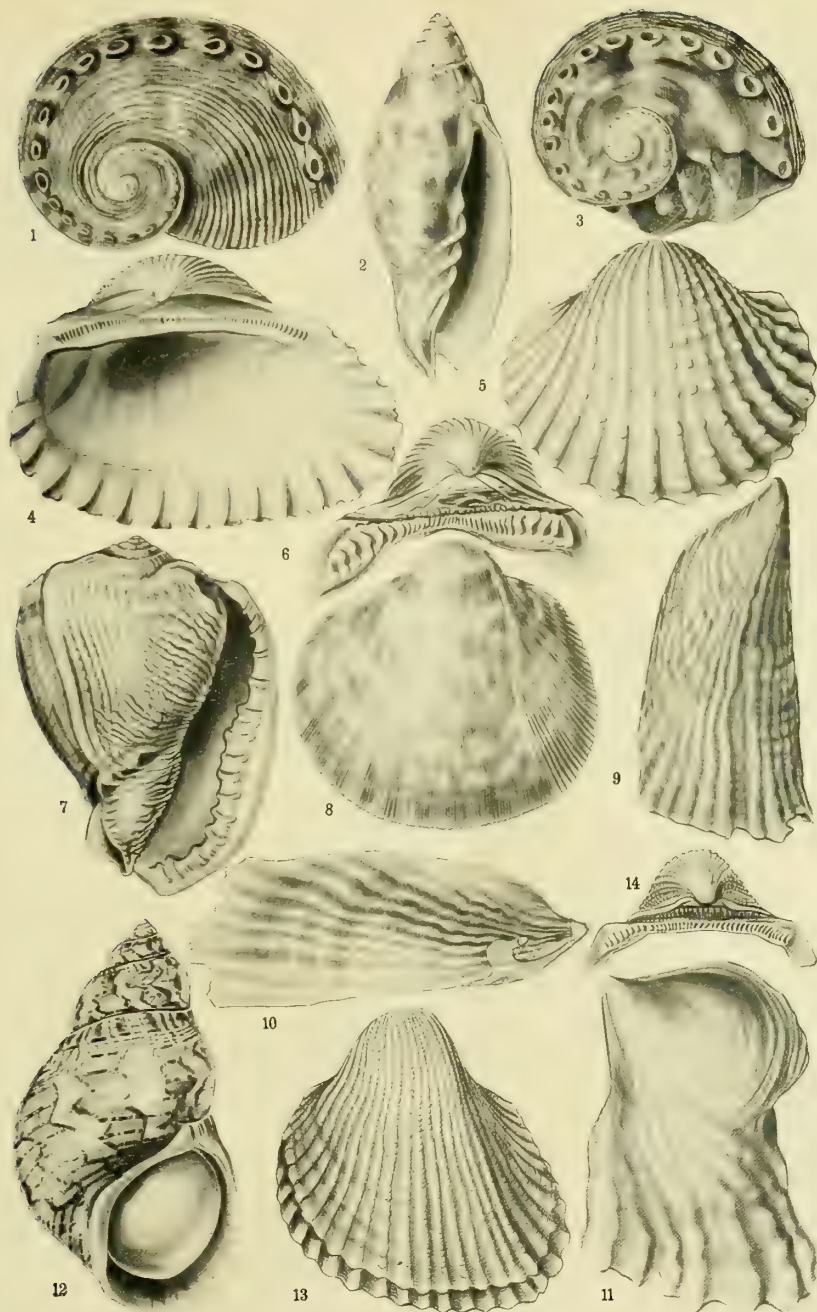
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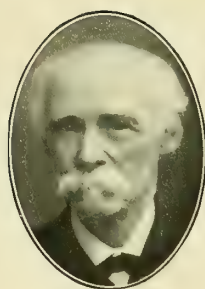
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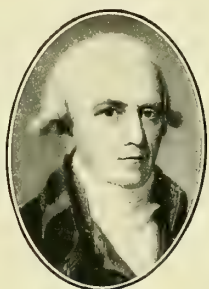
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